THE AEROPLANE and ASTRONAUTICS

OCTOBER 23, 1959

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THE AEROPLANE and ASTRONAUTICS

VOLUME 97 NUMBER 2505 OCTOBER 23, 1959

Helicopters and the Army

At the start of the Army exercise reported in this issue General Lennox remarked, "To be without helicopters in this day and age is unthinkable, though to what extent you can afford them is another matter." Increasingly the value of the helicopter as maid of all work, civil and military, is becoming appreciated. Now that Lord Douglas has stated the desire of B.E.A. to purchase a couple of twin-engined helicopters, the new Ministry of Aviation, we are sure, could count on the joyful collaboration of the Army in amassing any amount of development flying with such types. The soldiers can foresee all sorts of immediate applications for helicopters in the 4,000-lb. payload class as opposed to those of 4,000-lb. all-up weight.

Aviation—and Mr. Sandys

First reactions to the formation of a Ministry of Aviation have been generally favourable within the Aircraft Industry and for the most important of reasons, namely that it manifests the Prime Minister's belief in the importance of the Industry to the future of the country. We must agree this is indeed heartening.

When it comes to be considered whether the splitting of the former M.T.C.A. and the amalgamation of its civil aviation side with the bulk of the departments of the now defunct Ministry of Supply is the best way of doing this, there will be plenty to debate the issue.

The primary function of a minister concerned with the aviation constructing business must be to see that customers get the best products which the genius of the country and the skill of its craftsmen can ensure. It is not clear why to this task should be added the overseeing of such customers as the nationalized air transport concerns and the independent operators. The solution to this problem is not rendered easier since the requirements of the Service operators are to be co-ordinated by another department.

This aspect may not immediately strike people as important nor will it cause undue concern to those who consider that the chief function of the nationalized air transport operators is to provide an aerial shop window for the products of the British Aircraft Industry. It is understandable that the air transport operators may see it in a less philosophical light.

In the long-term view there can be no doubt that Mr. Sandys' new Ministry will be regarded as successful just as much as it succeeds in establishing and giving life to a long-term programme of research and development. In this connection it is much to be regretted that the new Ministry was not given the title of Aviation and Astronautics. It has been clear for a long while now that no Ministry of Defence can afford to neglect the military potentialities of satellites.

Those of limited vision who argue that space exploration is a matter of prestige, too expensive for this country, should listen to Sir Winston Churchill. Inaugurating at Cambridge the new college which bears his name he said:—

> "Let no one believe that the lunar rockets . . . are merely ingenious bids for prestige. They are the manifestations of a formidable advance in

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technology. As with many vehicles of pure research their immediate uses may not be apparent.

"But I do not doubt that they will ultimately reap a rich harvest for those who have the imagination and the power to develop them and to probe ever more deeply in the mysteries of the universe in which we live."

Under the present arrangement will the new Minister of Defence have to ask the Lord Privy Seal about the military potential of satellites? And if so, who will be the Minister to ask the Minister of Aviation for a ballistic missile, such as Blue Streak, so that one of the Service ministries may launch a satellite?

But however big the space problem looms, the immediate problem demanding solution is how to set about building supersonic airliners. Every aircraft engineer knows that such craft are going to be built, if not in the United Kingdom, certainly elsewhere. Consequently, no aircraft industry has any hope of retaining a leading position if it fails to develop aircraft in this field.

Today we know much more about the potentialities and costs of such aircraft than we did before the Supersonic Transport Aircraft Committee was called into being. The evidence of debate and of research is there for Mr. Sandys to study. So much has been made of the astronomical sums involved that it is to be hoped that we shall be favoured with more accurate estimates of the costs involved.

We trust that Mr. Sandys will also find time to probe the executive market. Production of world-saleable aircraft demands engine development, for we have nothing to compete with the horizontally-opposed piston-engines now in vogue for executive aircraft.

Matters of Moment

The New Ministers and Aviation

WHEN the Prime Minister announced last week that his new Cabinet of 19 would contain a Minister of Aviation, the statement was hailed widely, and not least in the Aircraft Industry itself, as confirmation of Mr. Macmillan's intention to see that British aviation got a new deal. The swelling tide of enthusiasm has not been damped by the fact that the new Minister is Mr. Duncan Sandys, a former Minister of Supply and later, as Minister of Defence, sponsor of the Defence White Paper of 1957 which so sorely dashed the future aspirations of the Aircraft Industry.

Accompanying the new appointment is the transfer of Mr. Harold Watkinson, following the division of his former Department, to the political headship of the Ministry of Defence vacated by Mr. Sandys. At the same time Lord Hailsham, now Lord Privy Seal, is to be the member of the Cabinet responsible for Science and Technology though he will have no Ministry. He will assume responsibility for the work of the Atomic Energy Authority, the Department of Scientific and Industrial Research, the Medical Research Council, the Agricultural Research Council, the Oversea Research Council and the Nature Conservancy. The United Kingdom contribution to space research will also be placed under his supervision.

Above left, Lord Hailsham, Lord Privy Seal and Minister for Science. Above, Mr. Duncan Sandys, Minister of Aviation. Left, Mr. Harold Watkinson, Minister of Defence.

Soon after Mr. Watkinson's appointment a spokesman for his Ministry made it clear that no change was contemplated in its relationships with the three Service Ministries (Air, War Office and Admiralty). This was confirmed by a statement issued by Mr. Sandys on October 17. In this he said:—

"The responsibilities of the Minister of Defence for major defence policy were clearly defined in the White Paper approved by Parliament last year: and they remain unchanged.

"The greater part of the equipment programme for the three Services is already well under way: and the Ministry of Aviation within its sphere will be responsible for carrying it through.

"The special task for which I have been appointed to this new post is to strengthen the structure of the British Aircraft Industry and to promote the expansion of the British air services. This will be much facilitated by the Prime Minister's decision to give a single Minister responsibility for both aircraft production and civil aviation.

"I am arranging at once to see the principal manufacturers, the heads of the airways corporations and representatives of the independent airlines."

The official statement accompanying notice of the new appointments said that the Minister of Aviation will take over: (1) the responsibilities of the Minister of Transport in respect of civil aviation; (2) the responsibilities of the Minister of Supply for research, development and production of aircraft (both civil and military), guided and atomic weapons, radar and electronics.

This can only mean the transference to the new ministry of all the air branches in the now defunct M.T.C.A. plus all those in the former Ministry of Supply less those to be transferred to the Secretary of State for War, which one now learns will include the Royal Ordnance factories. There can be no question now of the octopus being shorn of its tentacles. The new Minister of Aviation seems certain to preside over a Ministry with an even larger staff than did Mr. Aubrey Jones.

On the air side the M.o.S. had two controllers, one for aircraft, the post to which Sir George Gardner has recently been appointed and the other (the new holder is yet to be announced) for guided weapons and electronics. Below them came seven directors-general respectively for atomic weapons, technical development, guided weapons, electronics (research and development), ballistic missiles, aircraft production, and scientific research. Below them were two dozen directors responsible for aspects of contracts, research, guided weapons, electronics, research and development of aircraft, equipment, engines, armament, navigation and materials.

Under the new chief scientist, Dr. Cockburn, come the very large scientific staff concerned with all these fields.

Controlled by the Ministry of Supply were the Royal Aircraft Establishment at Farnborough and its stations at Bedford, Aberporth, Llanbedr, Orfordness and West Freugh; the Rocket Propulsion Establishment at Westcott, the Aircraft and Armament Experimental Establishment at Boscombe Down; the National Gas Turbine Establishment at Pyestock; the Royal Radar Establishment at Malvern; the Empire Test Pilots School at Farnborough; and other establishments at Cardington, Henlow and Helston. The Aeronautical Research Council advised the Minister of Supply about research matters; under the new dispensation it will presumably report to the Aviation Minister.

In addition to this vast organization are all the branches to be taken over from the air side of the former M.T.C.A. Under the heading of Civil Aviation this includes three groups dealing with air services, air safety, and civil aviation accidents investigation under Gp. Capt. Tweedie. Under the Ground Services division come aerodromes, navigational services, supply, operational research, and directorate of works. The

AERIAL LIFTER.—A Bristol 192 (two Napier Gazelles) recently carried this large parabolic aerial from Cambridge to a site six miles away. The aerial, which is for a radio telescope, is 27 ft. in diameter and weighs 2,000 lb.

Civil Aviation Divisional Organization has four main sections. Another responsibility is that for civil air attachés and advisers.

Reporting to the Minister will be the National Civil Aviation Consultative Council, the Air Safety Board, the Commonwealth Air Transport Council, the Air Transport Advisory Council and advisory councils for Northern Ireland, Scotland, Wales, the Channel Islands and the Isle of Man.

With these branches to aid him the Minister will carry responsibility for B.E.A. and B.O.A.C., the regulation of all civil flying and negotiation of international air transport agreements; air traffic control, registration of aircraft and the licensing of aircrew and maintenance personnel. In the latter connection the new Minister may be presumed to have inherited his predecessor's undertaking to introduce legislation for licensing operators in addition to his existing responsibility for licensing routes (see THE AEROPLANE AND ASTRONAUTICS for August 14 last).

Resolving the Differences

THE chairman of the Air Registration Board, Lord Brabazon, and the chief executive, Mr. R. E. Hardingham, are discussing airworthiness problems with General Quesada, administrator of the U.S. Federal Aviation Agency, and with other F.A.A. officials.

It is hoped that these discussions will help to obviate some of the outstanding difficulties which continue to exist in the export and import of aircraft, engines, components and accessories between the two countries.

In many cases of difficulty the present position is unfavourable to the U.K. in spite of the tremendous British effort in post-War years to minimize the differences in regulations, requirements and methods. Past discussions (with the C.A.B. and C.A.A.) have led to a fair measure of agreement and understanding on the subject of reciprocal acceptance of new aircraft, engines and propellers, and the Board has achieved considerable success in its line-by-line comparison of airworthiness requirements.

The position in regard to parts and accessories is, however, far from satisfactory and much of this is due to the interpretation of Part 10 of the U.S. Civil Air Regulations.

A Short-haul Convair

CAPITAL AIRLINES' order for seven Convair 880s—under discussion since January, 1958, when financing difficulties led to the proposed purchase of Comets to be abandoned—is linked with the development of a special short-haul version of the 880. Known as the Convair 880-M, the new variant is described as "a custom-designed version" which will develop its lowest seat-mile costs over medium-to-short ranges.

Preliminary details of the 880-M show that it will be dimensionally the same as the basic 880 Model 22 (see our previous issue, pages 352-353), but with leading-edge slats, a larger fin and power-boosted rudder for better short field performance. Maximum landing weight will be increased, to permit multi-sector operations without refuelling, and turn-round times will be reduced by using pre-loaded baggage and cargo bins.

Powerplants in the 880-M will be General Electric CJ805-3B turbojets. Compared with the -3 engines in the basic 880, these will have 4% more thrust (11,700 lb.s.t. each) and 2% lower specific fuel consumption.

Capacity of the 880-M will be 88 first-class or 110 coach-class passengers, or various mixed-class arrangements. Deliveries to Capital Airlines are to begin in October, 1960, and the 880-M is expected to be in service before the end of the year. Orders for the 880 family now total 85, with options on 34 more held by purchasing airlines.

The Swing-tail Boeing

FURTHER details have now been given by Boeing of their Type 735 swing-tail cargo-liner based on the 707 family of designs. Brief reference to the 735 was made in our Commercial Aircraft Number last week. Deliveries could be made in 1961.

The fuselage of the 735 has the same cross section as that of the 707 Intercontinental, and will provide a total of 9,000 cubic feet of pressurized and air-conditioned cargo space. A payload of at least 100,000 lb. can be carried, and flights across America with this payload could be made in five hours. Operating costs as low as three cents per ton-mile are mentioned by Boeing. Pratt & Whitney JT3D turbofan engines would be fitted.

A mock-up of the 735 fuselage has been built at Renton to show how the tail unit hinges to port to provide straight-in rear loading.

This project parallels a turbofan-powered DC-8 freighter with a swing tail, which Douglas are reported to be building at Long Beach as a private venture prototype. It seems clear that expansion of the air freight business is to be expected.

Swedish Radar Contract

A £1½-million order has been placed with Marconi's Wireless Telegraph Co., Ltd., by the Swedish Government for a new electronic air defence system for use by the Royal Swedish Air Force. Intended to cover only one area of the country, the system is to be operated and controlled from an underground centre now being hollowed out of granite rock. Other centres may be set up later to cover the rest of Sweden.

Developed by Marconi in close collaboration with the Swedish Air Force, the system employs various types of radar to detect and identify aircraft or missiles. These provide full positional and height information; and automatic tracking methods are also used. The relevant data are stored in an electronic "information bank" using digital techniques and fed to a computer for calculating interception details. Tabular and synthetic displays supplemented by television presentations showing ancillary operational information are employed, together with large-screen colour television projection displays of the complete air situation.

A further special feature of the Swedish air defence system is the provision of remote synthetic displays for civil defence organizations, civil air traffic control centres and other bodies. The system is claimed to be far more effective than any other in existence today.

Changes in Services Departments

FOLLOWING the announcement of the new Government and Ministerial changes last week, came corresponding news of appointments in the Services Departments. With three exceptions there have been changes in all the principal posts in these Departments.

At the Admiralty, the new First Lord is Lord Carrington, K.C.M.G., M.C., who succeeds the Earl of Selkirk, now

Lord Carrington, who has been appointed First Lord of the Admiralty.

appointed U.K. Commissioner for Singapore. Lord Carrington has been the High Commissioner in Australia since the end of 1956; prior to that he was Parliamentary Secretary at the Ministry of Defence.

The new Civil Lord in the Admiralty is Mr. Charles Orr-Ewing, who at one time was Parliamentary Under-Secretary of State for Air and more recently has been Parliamentary and Financial Secretary to the Admiralty—a post whch is not now being filled. He succeeds Mr. T. G. D. Galbraith.

At the Air Ministry, the Rt. Hon. George Ward remains Secretary of State for Air. A new Parliamentary Under-Secretary of State—Mr. W. J. Taylor, C.B.E.—has, however, been appointed to succeed Mr. Airey Neave who wished to be relieved of the task in order that he may devote more time to his work in industrial matters. Many of our readers will be sorry to hear of this departure from administrative affairs at the Air Ministry. Mr. Taylor comes to the Air Ministry from the Ministry of Supply where he was Parliamentary Secretary—a post he took up in 1957.

There have been no changes at the War Office. The Rt. Hon. Christopher Soames, C.B.E., remains as Secretary of State; and the Hon. Hugh Frazer, M.B.E., stays as Parliamentary Under-Secretary of State and Financial Secretary.

"Accepted in Spite of Ourselves"

Mr. Philip Wills, chairman of the British Gliding Association, writes:—

POSSIBLY in trying to condense a long history into the scope of your brief Editorial of October 9, you have, I think, quite incorrectly interpreted the attitude of the B.G.A. to the proposal that OSTIV should draw up international airworthiness requirements for F.A.I. Standard Class sailplanes.

When the F.A.I. decided to insert into World Championships a new Standard Class, with the aim of encouraging the design and development of cheap, sensible sailplanes, the B.G.A. was enthusiastically in favour. OSTIV was asked to draw up a specification calculated to produce the required result, and the eventual document was very largely the work of a number of B.G.A. technicians, notably Lorne Welch, working, as usual, in their spare time and for the love of the game.

The new class flew for the first time last year in Poland and was an immediate success, and I have no doubt it will play a great part in increasing the amount of gliding that goes on throughout the World over the years to come. The specification is now a part of Section 3 Class D of the Sporting Code of the F.A.I.

OSTIV then set about drawing up a set of airworthiness requirements for the Standard Class, and the B.G.A. took the view that their intention was eventually to have these written into the Sporting Code also. We resisted this proposal very strongly on the following grounds:—

(a) The existing variations between various national design requirements indicate that it would be premature to impose international requirements on the Standard Class in World Championships.

(b) Two consequences result from these variations:—

(i) International requirements would tend to include the most stringent cases from the national requirements.

(ii) Just as national requirements are modified from time to time, revisions of international requirements would also be necessary. Since OSTIV has no permanent staff, this would involve an interminable series of international meetings.

(c) The original spirit of the Standard Class specification was that it only specified, so far as possible, those features which could easily be measured or observed under the conditions prevailing at World Championships with the minimum reliance on documentary evidence. It was felt that acceptance of a Certificate of Airworthiness from the country of origin provided an adequate degree of safety without an excessive variation in weight penalty. Insistence on compliance with international requirements would greatly complicate the administration of the Standard Class entries, both at World Championships and beforehand. Again remembering that OSTIV has no permanent staff, who would decide whether a concession granted by a national certificating authority would be acceptable to the Championship organizers?

Whether as a result of our opposition or not, OSTIV has now recorded that it is not its intention that the new requirements, when drawn up, shall become mandatory. The B.G.A. has not the least objection to OSTIV drafting international airworthiness requirements for the Standard Class, provided that they are intended for the *guidance* of constructors or for application by nations who do not possess their own code. Indeed, several members of the Technical Committee in their private capacities as members of OSTIV have given that body considerable assistance in drafting the requirements.

In opposing the addition of international airworthiness requirements to the Standard Class specification, the B.G.A. is not acting from selfish or insular motives, it is merely trying to keep the specification as simple as possible to facilitate compliance and to reduce paperwork. We believe that this will benefit the participants more than any attempt to set up a miniature, amateur, version of I.C.A.O.

Caribous for the U.S. Army

THE U.S. Army took delivery of its first de Havilland D.H.C.4 Caribou at Downsview, near Toronto, on October 8. General Arthur G. Trudeau, Army Chief of Research and Development, accepted the log books of the first three aircraft from Russell Bannock, D.S.O., D.F.C., D.H. Canada's military sales director. General Trudeau said it was gratifying to receive such a large aircraft after operating so long under onerous weight restrictions. In the past, the army's mobility and tactics had been hampered by the quality of trucks and the number and quality of roads. The Caribous could have a profound effect on war.

Designated the YAC-1 (for Air Cargo) the Caribou is the second D.H. Canada aircraft to pioneer a new U.S. aircraft classification. The Otter was the first aircraft in the utility classification.

Just as the Otter started out as a King(-size) Beaver, so the Caribou started as a twin-engined Otter. During discussions with the U.S. and Canadian armies, the project grew and was modified to have Pratt & Whitney R.2000 engines and to be suitable for air drops. The decision to start construction was precipitated by a Canadian Army grant of $2,500,000. Mr. P. C. Garratt, de Havilland's managing director, said $25,000,000 had been spent on the project—a substantial investment for a relatively small company.

Seventeen aircraft are being built, of which five will go to the U.S. Army. The fourth Army aircraft is being equipped with reversible-pitch de-icing propellers for Arctic trials. The eighth aircraft, with internal long-range tanks, will leave in late October or in November, for a sales tour of Europe, the Near and Far East.

Despite the 200-ft. ceiling, the Caribou was demonstrated with *élan*. In a 15-m.p.h. wind with 32 troops aboard, it took off on wet grass in less than 400 ft. Such performance should have special appeal in under-developed areas. In addition, Federal Electric, the prime contractor for the Distant Early Warning radar line, and the Portuguese Air Force, are believed to be interested potential customers.

D.H. Canada has 10 years of STOL experience with the Beaver and Otter, both of which are still in production for the U.S. Forces and civilian operators. About 1,500 Beavers have been built, 940 of them for the American Services. Some of these are expected to be declared surplus next year, when production will probably be discontinued. The company's contract for 100 Grumman CS2F Trackers for the Royal Canadian Navy will be completed in 1960 also, so much depends on the Caribou's prospects.

In building so many aircraft on speculation, de Havilland has shown the courage of its convictions. The Caribou's remarkable performance, and the U.S. Army's enthusiasm for other D.H. products, suggest that their expectations of future orders will be fulfilled.—N.A.M.

Air Mobility and Supply

Photograph copyright "The Aeroplane and Astronautics"

LAST week the Army staged an air mobility exercise to test new techniques, equipment and thoughts on tactical air support. Starting on October 12 and lasting for five days and nights, the exercise was code-named "Red Banner." It was the outcome of trials which have been conducted during the year by the 3rd Division and 16th Independent Parachute Brigade Group, in conjunction with the R.A.F.; these trials had reached a stage where the experimental organizations and techniques could be put to the test on a Brigade Group scale.

"Red Banner" involved an air-delivered assault by a brigade formation of three battalions, two of which were to be parachuted and the third air-landed, and an "enemy" represented by the 1st Guards Brigade Group. The exercise had two main aims. One was to test the tactical handling of a Brigade Group of the Strategic Reserve operating on a small air-transportable scale of transport for a limited period against a second-class enemy with some first-class equipment. The second aim—and in many ways the more important—was to test the effectiveness of second-line support to the Brigade Group, based on helicopters.

If the maximum benefit is to be obtained from the airlift of, say, the United Kingdom-based Strategic Reserve to an overseas trouble area, speed is the most important factor. To obtain this, the force could have only the lightest transport and be expected to operate on a limited scale—within a radius of 100 miles of the airhead—until seaborne reserves and supplies could be dispatched.

Excluding the "enemy" (1st Guards Brigade Group), approximately 3,000 troops took part in the exercise. These comprised the 16th Independent Parachute Brigade Group, which included the Air Portable Squadron from the Royal Horse Guards with four troops of Ferrets, a troop of the Queen's Own Hussars with simulated Malkara anti-tank weapons; a Rear Air Supply Organization; and a Forward Maintenance Staff.

Supporting the brigade was the Joint Experimental Helicopter Unit (J.E.H.U.) operating eight Whirlwinds and four Sycamores; a flight of the 11th Light Helicopter Transport Company, U.S. Army, with four Sikorsky H-34s; nine Beverleys from Nos. 47 and 53 Squadrons at R.A.F. Abingdon; and 15 Hastings from Nos. 24, 36 and 114 Squadrons operating from R.A.F. Colerne. The Transport Command aircraft also took part in the recent Anglo-Norwegian combined Services exercise "Bar Frost" in Norway.

In addition, fighter ground attack sorties were undertaken by Sea Venoms of No. 894 Squadron from R.N.A.S. Yeovilton, and P.R. Canberras from Nos. 17, 31 and 80 Squadrons with 2nd T.A.F. in Germany flew photographic reconnaissance missions over the exercise area. Fleet Air Arm Sea Hawks operated in the tactical reconnaissance rôle and the 19th Reconnaissance Flight of the Army Air Corps with Austers supported the "enemy" forces. On the fourth day the Bristol 192 and the Westland Westminster were demonstrated in the close tactical rôle.

The Battle

Nothing comparable to this exercise had been undertaken by the Army before and a great deal of thought and planning had gone into it. To simulate the light transport situation each of the three battalions was limited to 39 quarter-ton Land Rovers and trailers, and all troops, supplies and equipment were to be flown in by Transport Command. An average day's supply requirements for the brigade, all of which was flown to the front by helicopter, was of the order of 105 short tons —of which 58¼ tons was ammunition.

Two base airfields (Abingdon and Lyneham) were used to dispatch troops and their equipment to the forward area where one airfield (Keevil) was operated for the transport aircraft, and a helicopter base and Forward Maintenance Area (F.M.A.) were set up to transfer the stores to the front line. Although it involved the double handling of supplies, the forward transport airfield at Keevil and the F.M.A., where the stores and equipment were built up, were separated by approximately half a mile for tactical reasons.

A forward surgical unit was also established at Keevil and the helicopters brought casualties back from the front after their supply delivery flights. From Keevil, the wounded were transferred to the base airfield by the R.A.F. transports.

On the first day the early morning drop of the 3rd Parachute

Troops boarding a Bristol 192 which took part in the helicopter demonstration on the fourth day of the exercise.

Battalion was abandoned because of weather conditions and these troops were put into the area by road. In the afternoon, however, the second drop comprising the 1st Parachute Battalion took place at the pre-planned time.

In this operation the 15 Hastings each dropped 30 men and the nine Beverleys each carried 20 men and two heavy-load platforms containing the Land Rovers, trailers, a 105-mm. dual-purpose gun and the 106-mm. anti-tank gun. Altogether a total of 630 troops were dropped with their guns and transport, which were off-loaded from the platforms within 15 minutes.

The next day saw the start of the airlift and the build-up of troops and supplies. This included the air landing of the 3rd Division's Rear Headquarters; the 1st Battalion, Welsh Guards; the four troops of Ferrets, from the Royal Horse Guards, and the simulated Malkara anti-tank missiles of the Queen's Own Hussars.

At Keevil, Transport Command had 70 ground personnel operating the control and turn-round of aircraft, while the troops unloaded the Beverleys with the aid of fork-lift trucks. Tractors and trailers were employed to transfer the "palletized" supplies to the F.M.A. for loading on to the helicopters. The average unloading time for a Beverley was 10-14 minutes.

An interesting development in the carrying capability of the Beverley is the new method of loading which allows two Army 3-ton trucks and two 1-ton trailers to be accommodated. This compares with the original load of only one 3-tonner with trailer.

Helicopter Support

On October 14 and 15 the movement of supplies and equipment to the front-line troops by helicopter was undertaken on a large scale. This stage of the trials—testing and evaluating the economy of helicopters for close tactical supply work—is obviously of great importance to the Army. And although no doctrine has been approved by the War Office, the helicopter has a numoer ot major advantages over land vehicles for this type of operation.

In the first instance, it obviously has far greater flexibility than land transport in getting supplies and troops to the forward areas. It is unaffected by physical obstacles such as rivers, rough ground and woods.

The use of helicopters also means that the requirement for road engineering work is largely done away with and the material needed for such a task is saved. The helicopter has been proved to be the ideal vehicle for both casualty evacuation and command requirements. The movement of troops at the front can also be speeded-up by the use of rotary-wing aircraft.

Against these advantages, and particularly in the "fire-brigade" rôle, there are a number of problems that need to be overcome if the helicopter is to be ready for instant deployment. The first is its limited range and relatively slow speed for long ferry flights to the theatre of operation. If it has to be transported by sea, the object of the exercise—speed and time—is lost, so that the placing of helicopters in sufficient numbers in strategic areas is a major requirement.

Another important factor in the Army's view is to have the complete command and control of such aircraft, as opposed to requesting them—however good the operator—from another Service. No general likes forces or vehicles that are not under his complete control.

Actual assessment of the usefulness of the helicopters in "Red Banner" is greatly complicated by the fact that three types, with two vastly different payloads, were involved. The Sycamores and Whirlwinds of J.E.H.U. have a payload of

Above, the Westland Westminster crane easily lifts a half-ton long-wheelbase Land Rover and its 105-mm. howitzer.

Photographs copyright "The Aeroplane and Astronautics"

Left, troops unloading a Transport Command Beverley at Keevil. Handling equipment includes fork-lift trucks, trailers and tractors for moving the "palletized" loads to the F.M.A.

Right, a 105-mm. howitzer with its half-ton Land Rover being off-loaded from a heavy-load platform after it was dropped from a Beverley.

Left, the C.O. of the Joint Helicopter Experimental Unit, Lt.-Col. D. Coyle, M.B.E., D.F.C., briefing helicopter crews prior to the start of a day's flying.

Photographs copyright "The Aeroplane and Astronautics

Members of the Services and industry at the trials included, left to right, Sqn. Ldr. Twig, Mr. R. Morton (Fairey), R. Smith (Bristol), Sqn. Ldr. Clarke, Sqn. Ldr. Darling, Mr. P. Twiss (Fairey) and Mr. Brown (Fairey).

700-800 lb. and 1,000 lb. respectively, and the H-34s, 3,000 lb.

From earlier assessments, however, J.E.H.U. has estimated that the 1½-ton-payload helicopter of the Westland Wessex type is the best answer to the Army's requirements. This has been found to be the largest helicopter that can be effectively operated in the forward area, and capable of carrying a reasonable load.

Based on the Sikorsky S-58 (U.S. Army designation H-34), which has been in production in the United States for a number of years, the Wessex is powered by a 1,430 s.h.p. Napier Gazelle free-turbine engine. It has a normal all-up weight of 12,600 lb. and in the supply rôle has an internal or underslung freight capacity of 4,000 lb. at ranges of up to 40 n. miles or 1,142 lb. for 300 n. miles.

For casualty evacuation or transport duties the Wessex could carry up to 12 passengers or eight stretchers. With a cruising speed of 127 m.p.h., a service ceiling of 17,000 ft., and a 460-mile ferry range without extra tanks, it would be well suited for Army work.

Another helicopter with a great deal to offer the Army, and demonstrated at the exercise, is the Westland Westminster. In its "flying crane" form it can carry a standard Army 6,725-lb. bridging section and has a total lifting capacity of 15,000 lb. Although not considered so useful for the very close support work demonstrated last week, the Fairey Rotodyne—with its higher speeds and longer range—would fill the supply vehicle rôle over distances of up to approximately 650 n. miles.

Unlike the U.S. Army's H-34s, the J.E.H.U. Whirlwinds and Sycamores are not equipped with instrumentation for all-weather flying and operational night sorties are restricted to a cloud base minimum of 1,000,1-500 ft. and visibility of 2-5 n. miles. The main navigational aid that can be set up in the field is Eureka and, equipped with Rebecca, the helicopters have a 25 n. mile radius of action at night.

But with all its interest in helicopters and general close tactical support aircraft, the Army has two major problems to overcome. First, it has very few helicopters—J.E.H.U. is a combined Army/R.A.F. unit. Secondly, the present 4,000-lb. all-up weight limit on Army Air Corps aircraft is well below the weight of all the helicopters the Army is interested in—including the 5,000-lb. Mk. 2 Saunders-Roe P.531.

In his briefing at the start of the exercise, Maj.-Gen. G. C. Gordon Lennox, General Officer Commanding, 3rd Division, neatly summed up the Army's present situation in this respect. He said: "To be without helicopters in this day and age is unthinkable, though to what extent you can afford them is another matter."—P.R.R.

Above, a J.E.H.U. Whirlwind hovering to pick up a 1,000-lb. palletized load at the F.M.A. A total of eight Whirlwinds and four Sycamores took part in the movement of troops and supplies.

A U.S. Army H-34 picking up a load of supplies at the Forward Maintenance Area for dispatch to the battle area.

Air Transport

Behind the IATA Headlines

PEOPLE outside the air transport business must have been astonished by the apparent *volte-face* in the news about the IATA traffic conferences between Tuesday and Wednesday of last week. The newspapers on Tuesday, October 13 (nothing to do with the date), carried solemn headlines about "difficulties," "deadlocks" and "rejected cut-price plans." On Wednesday the headlines were all about "big fare cuts" and "holiday travel reductions" in Europe.

Strangely enough, the two series of news stories were, in general, quite correct. The IATA traffic conferences were, by and large, a failure so far as blanket World-wide fare-cuts were concerned, but B.E.A.'s own policy, before and during the conferences, of trying for piecemeal, special-case, bilateral reductions (about which many people had been critical), was a successful one for its own purposes. The Corporation did not obtain approval of all its proposed fares, but it obtained agreement on a useful proportion of them and was more immediately successful in Hawaii than it would have been with any longer-term overall reduction policy.

But why, the onlooker might ask, was not the comparative success of this limited-objective policy in the European and Middle East areas made known just as soon as the IATA conferences were over on October 10? The reason is that the Association has a very strict rule of silence (backed by a heavy forfeit in cases of serious leakage) during the conferences and nothing useful can be said by members until an official statement has been issued.

Hence the fact that, even on October 12, when air correspondents and others had a chance of talking to the airline executives at the opening of the IATA annual general meeting in Tokyo, the reports were consistently gloomy and even B.E.A.'s Lord Douglas could say nothing about his Corporation's successes—though he managed to convey the impression of being "undismayed" by the situation.

When, on October 13, the official IATA statement about the result of the conferences was issued, B.E.A. felt free to say what it had itself salved from the overall wreckage. A spokesman said that the Corporation had "obtained agreement with most of its partners on European services for substantial reductions in fares on certain routes during the spring and summer holiday seasons." Assuming Government approval, there will be reductions between 15% and 25% from April 1, 1960.

These reductions will apply, on certain routes, to tourist-class day fares to Spain, Italy, Portugal, France, Russia (not, of course, an IATA member) and parts of Austria and Germany, and to night fares to Spain, Italy, France, Portugal and Greece. The statement also gave November 1 as the date for a return of the £8 winter return fare on the London-Edinburgh, -Glasgow and -Belfast runs.

The information issued by IATA in Honolulu came from the chairman of the conferences, Mr. W. Gordon Wood, of Trans-Canada Air Lines, who explained that "the airlines considered very seriously the lowering of fares for mass travel, but had widely differing views as to the extent this is economically feasible in a period of rising costs and rapidly changing operations. Inevitably, there have been more than the usual number of opinions and sets of facts to reconcile. I am hopeful that there will be an eventual meeting of the minds, but it will need more give and take than we have had at Honolulu.

"We have not," he added, "been able to close fares over most intercontinental routes around the globe because of disagreement over the basic ingredients of the fare structure on long-haul routes from Europe south to Africa and east to India, the Far East and Australasia. This, in turn, has made it impossible to reach effective agreement on inter-related routes across the Pacific and the North Atlantic.

"A principal issue has been the extension of economy class service, at fares considerably lower than the present tourist fares, into new areas. A number of carriers are anxious to develop increased traffic there by such wide-spread reductions. Others believe that the present economic conditions of many parts of the regions concerned, and of the airlines themselves, would not support this concept. A more selective policy of promotional fares, to provide cheap service in those regions where it can be expected to develop compensatory volume, has also been proposed.

"The situation is further complicated because the fleets of most of the airlines concerned are in a state of transition, and any agreement must provide at one and the same time for piston-engine, turboprop and jet aircraft, of different sizes and characteristics, being introduced at different times along the routes under discussion. Few of the airlines concerned in these areas have as yet flown their jets commercially, and their actual performance and costings over the routes in question—on which fare levels must largely depend—have not been fully proved.

"This problem of selling both jet and propeller-driven services over the same routes has now, of course, become global in scope. Many carriers believe some kind of differential must be maintained between faster and slower aircraft, but there are differences of opinion as to whether this is indeed desirable and, if so, whether the differential should be one of price or of service.

"Other serious and related problems before the conferences here have been the number of classes of service to be offered to the public on international routes and the configuration of the new aircraft. A few of the airlines who wish to extend economy class services also desire to retain the tourist class as well. Others believe that there is no real requirement for a middle class and hold that economy class is feasible only if tourist services are eliminated.

"Closely linked with this is the problem of agreement on standard specifications for seating in the various classes of the new jet aircraft.

"Because the speed, size and productivity of the new generation of airliners require that they be flown interchangeably over domestic and international routes, and through many different areas in a short time, many of these problems cannot be isolated within

(*Continued on page 379*)

CANADAIR DEBUT.—This first photograph of the prototype Canadair CL-44 long-range transport outside the flight hangar at Montreal, shows to advantage its clean lines. It is powered by four Rolls-Royce Tyne turboprops and the first 12 production aircraft are for the R.C.A.F. First flight of the prototype is expected next month.

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individual areas. What could have been dealt with a few years ago by regional agreement must now be matters of global concern. "It is fair to say that the airlines have never before been faced with problems of such complexity, or with a similar necessity for adapting themselves to several considerations—economic, technical and even political—at the same time."

Meanwhile, World cargo rates and fares within Europe and the Middle East, and between these two areas, have been agreed, with a wide range of cheap holiday fares to stimulate mass travel. Fares were also agreed on the South Atlantic. Discussions about fares within the Western Hemisphere continue and there has been agreement on maintaining economy fares over the North Atlantic, but there has been no agreement on those for international routes elsewhere in the World.

The normal cargo rates on all the international routes have been revalidated, with certain changes, but provision has been made for drastic reductions in a series of specific commodity rates to encourage volume traffic over the North Atlantic. These will bring air cargo rates down to 70 U.S. cents per kg. for shipments over 45 kg. in many commodities. Additional "weight breaks," giving lower rates for larger shipments of general cargo, have been introduced on the North Atlantic and the North Pacific.

Later news from Tokyo made it clear that, unless there is a marked change of attitude, there will be no subsequent traffic conferences before the date (March 31) when the present fare agreements expire. In this case there will be a so-called "open-rate situation" on the routes between Europe and South Africa and the Far East, and in certain Pacific areas.

Contrary to the usual IATA attitude, Mr. Wood was reported as commenting that such a situation had existed before in certain areas "without disastrous results and a lot of good emerged from them." Faced thus with the open-rate prospect, nobody appears to be talking about "chaos" or "anarchy."

Statements from Sir Gerard d'Erlanger, chairman of B.O.A.C., and from the Corporation's managing director, Mr. Basil Smallpeice, reflected the overall disappointment of some of the bigger long-haul carriers. After saying that the Corporation's main objectives had been for the introduction of Atlantic-type economy class fares in other areas, Sir Gerard added that "B.O.A.C. is extremely disappointed that the traffic conferences had not found it possible to reach agreement on this principle. It will now be necessary for B.O.A.C.—and for that matter, presumably, other carriers as well—to take stock of the situation thus created. It will also be necessary for B.O.A.C. to consult with the British Government as to the likely future pattern of fares on British cabotage routes."

Mr. Smallpeice said that the Corporation "had certainly hoped for a decision that would have enabled us to offer on our routes to the South and East of the U.K. a fare which would have been some 20% lower than the current tourist rates on most of our routes throughout the World.

"B.O.A.C. has for long been in the forefront of the movement for cheaper air fares and we shall not relax our efforts to convince other airlines belonging to IATA that it is sound policy to introduce cheaper fares on routes where they are not at present applicable."

By way of postscript it might be added that it is not so many years since B.O.A.C. were vigorously resisting the independent operators' low-fare cabotage services to and from Africa. Times and conditions change.

THE NEW RONGOTAI.—Wellington's new airport at Rongotai, five miles from the city centre, is to be officially opened tomorrow, October 24, and will replace the main domestic airport at Paraparaumu, 35 miles to the north. The single north-south runway, with clear approaches over water from each direction, is 5,350 feet long, with 400 feet of stopways.

A Swiss Independent

BALAIR A.G., one of the leading Swiss charter companies, demonstrated a comfortably appointed DC-4 to travel and charter agents at Gatwick last week. This company, with a fleet of two DC-4s (ex-Swissair) and two Vikings (ex-B.E.A.) has been expanding its activities in the past three years or so and now offers to fly anywhere in the World.

Particular attention has been paid to comfort and to cabin service, as the company believes that passengers, even on charter flights, are much influenced by these points. The DC-4 demonstrated had 72 seats, in a five-abreast arrangement, with two toilets aft and a large galley forward. Grey upholstery with red carpets and curtains provided a pleasant background for gay candy-striped pillows and plaid rugs. Passenger services included oxygen plug-in points down each side of the cabin.

Balair, with some 150 employees, is owned by Swissair (about 40%), the city council of Basle (25%) and private interests (35%). Its home base is at Basle and in addition to charter flying the company has a division for the training of commercial and private pilots.

In these days of jet sophistication, it may be interesting to record that a short flight in the Balair DC-4 was, for the writer at least, a wholly pleasurable occasion. Neither the noise nor the vibration were as bad as the jet traveller tends to remember them; indeed, we have found conversation more difficult in some turbojet and turboprop transports than in this DC-4. Jet flying *is*, of course, the most comfortable possible—but have its delights been a little overplayed?—F.G.S.

Accident Survey

ALTHOUGH the latest M.T.C.A. accident survey*, for the year 1957, offers some mildly alarming statistics, the average figures for safety on passenger-carrying services were not seriously affected. The passenger-fatality figure per 100 million passenger miles was 2.3, by comparison with an average of 2.6 for the years 1953-57 and with 1.4 for 1956.

There were four accidents on scheduled passenger services and seven on other transport operations. Seven of these 11 accidents were attributed to "faulty operation or omissions on the part of the crew." The least satisfactory figures were those for flying-club aircraft, which were involved in 63 accidents during 1957 by comparison with 27 in 1956, and a large proportion were attributable to pilot error.

Of the 11 air transport accidents, seven involved loss of life, with 120 fatalities including six on the ground. Five of the accidents occurred during the approach phase—though two followed engine failure on take-off and one was the result of flap failure followed by locked ailerons. There were three landing accidents.

*"A Survey of the Accidents to Aircraft of the United Kingdom in the year ended December 31, 1957." H.M.S.O., 2s. 6d.

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The Moscow Comes to London

WORK on runway extensions at Copenhagen Airport has caused Aeroflot to substitute Ilyushin Il-18 Moscow turboprop transports for the usual Tu-104As on the Moscow-Copenhagen-London service. Two runways have been closed at Copenhagen, and limitations imposed on one of the others. The Tu-104s will resume operation as soon as the restrictions are lifted—probably early next month; Aeroflot has no intention, as reported in some newspapers last week, of using the Il-18 permanently on this route, nor does the Tu-104 have any difficulty with fuel reserves when coming into London.

The first Il-18 landed at London Airport at 14.10 hrs. on October 14, operating the regular SU031 service out of Moscow, with 71 passengers. This arrival was four hours behind schedule because of a diversion to Amsterdam caused by below-minima visibility at Copenhagen. Many of the passengers had onward bookings to North America and elsewhere, and there was some further delay at Amsterdam while alternative arrangements were made for them; at the same time, Aeroflot passengers waiting at London Airport for the return service to Moscow were transferred to a Czech Airlines Il-14 on the London-Prague service. This is the kind of situation which every airline has to face from time to time and Aeroflot, with perhaps less experience than many international operators, seemed to be coping quite well.

The Il-18 is already well known outside Russia, and has been seen in Geneva, Paris, Sofia, Berlin, New York and other cities, although it does not yet serve regularly on international routes. The example at London on October 14—others have been seen on the service since—was numbered CCCP 75768 and was an all-tourist version with 60 seats in the main cabin—divided in two by a heavy green curtain—and 15 in the forward compartment, ahead of the large galley and baggage vestibule. Upholstery of the seats, in triple and twin units, was green, with brown leather armrests; the plastic-covered walls were cream, carpet was blue and curtains patterned in lilac and grey.

The flight deck, with contemporary grey finish, is laid out for two pilots, navigator (behind the captain), radio operator (behind the co-pilot) and flight engineer on a jump seat between the pilots (see photograph in our September 4 issue, p. 87). Cabin crew normally numbers three.

Cabin doors, at the front and rear, both slide in runners inside the cabin, while the doors to the two capacious underfloor baggage holds open inwards and upwards. We noted two spare wheels in the forward hold. Evidence of a fail safe structure was the division of the wing underskin into spanwise strips.

The Shell-Mex and B.P. fuelling crews which met the Il-18 were puzzled to find no obvious refuelling points, until it was demonstrated that these are inside the wheel well, the main doors for which are normally closed on the ground, but can be opened by releasing a lock manually through an access panel in the nacelle.

The Il-18, according to members of the crew, has a typical cruising speed of 350 knots (650 km./hr.) and a maximum speed of 410 knots (760 km./hr.). The gross weight was given as 136,700 lb. (62 tonnes) and take-off distances (four-engined), 4,600 ft. (1,400 m.) ground run and 5,580 ft. (1,700 m.) to 330 ft. (100 m.). The max. range was given as 2,700 naut. miles (5,000 km.) with 1 hr. fuel reserve. The Il-18 is, we gathered, a popular aeroplane with the pilots, who especially remarked on its three- and two-engined performance. The 4,000 h.p. Ivchenko AI-20 engines are now standard.—F.G.S.

Above, a view looking aft in the main passenger cabin of the Il-18, divided in two by the curtain "bulkhead." The standard of furnishing compares with that of the Il-18's Western contemporaries.

C.P.A. Transcontinental

WRITING in *The Vancouver Sun* last month, Mr. Grant McConachie claimed that C.P.A. was achieving the highest passenger load factor of any airline in North America on its trans-Canada route. The service started on May 4 in competition with T.C.A. and is flown with Britannias. Average load factors achieved are 84% west of Winnipeg and 95% east of Winnipeg

Contrary to the fears of some senior C.P.A. officials, the service to date has made money. If C.P.A. is granted permission to increase frequencies when the application comes up for review—probably late next year—C.P.A. is (despite the doubts of T.C.A.) determined to maintain its standard of cabin service. At present, C.P.A. provides hot tray meals in tourist class, whereas parallel T.C.A. flights serve only box luncheons.

Mr. McConachie said that C.P.A. will put turbojet airliners on to the route as soon as it can get them; an early decision between DC-8s and Boeing 707s will have to be made. Meanwhile, T.C.A. hopes to start operating its Conway-engined DC-8s (six on order) out of Vancouver on April 1.

Right, luggage is unloaded simultaneously from the front and rear baggage holds. The aircraft is finished with a white top, blue trim lines and red flag on the fin.

Left, servicing crews and airport officials study the Il-18 with interest on its first visit to London Airport. About 50 are now said to be in service with Aeroflot.

Photographs copyright "The Aeroplane and Astronautics"

Helicopters for B.E.A.

Three types which might meet the Corporation's immediate requirements

AS a lead-in to its operation of the Fairey Rotodyne, British European Airways hopes to be able to purchase and operate a smaller type of helicopter on an interim basis. This news, which we reported last week, indicates that B.E.A. has been studying the possibilities of several alternative small-scale scheduled helicopter services. The Corporation would now like to go ahead with plans for at least one route, with a view to starting operations within the next two years: but the difficult question of financing has still to be resolved.

The studies made by B.E.A. show that any operations with helicopters available now or in the near future are likely to be done at a loss, which the Corporation does not feel able to bear on its own. The crux of the matter at the moment, therefore, is to obtain some form of Government subsidy, either as a lump sum grant, as a per-mile or per-passenger subsidy, or perhaps by Government purchase of the helicopters under a similar arrangement to that made for the three B.E.A. Dart Heralds. A decision on this point should be an early priority for Mr. Duncan Sandys at his new Ministry of Aviation.

If B.E.A. is allowed to go ahead with its plans, it will probably require two multi-engined helicopters with accommodation for 20 to 25 passengers. The Vertol 107, Sikorsky S-61 and Bristol 192C have been specifically mentioned as being in the right class, and seem to be, in fact, the only helicopters likely to meet the B.E.A. requirement at this time. Each is briefly described below. (Details of the Fairey Rotodyne, for which B.E.A. is now negotiating, were included in our Commercial Aircraft Number last week.)

The Sikorsky S-61.

Among the routes known to have been studied by B.E.A. is that from Land's End to the Scilly Islands. This 30-st.-mile route is flown at present by Islander-class D.H. Rapides, of which B.E.A. has only two left, and, as we explained in our issue for September 11 (page 156), is one on which a multi-engined helicopter could be used to advantage. Services in the London area might also be tried—between London Airport and Gatwick, for instance, for which B.E.A. already has route approval from the M.T.C.A.

Whatever the route to be flown, B.E.A. will demand multi-engined reliability, flotation gear or amphibious capability, and reasonably complete instrumentation for all-weather operations to help build up experience for the Rotodyne. The Helicopter Experimental Unit at Gatwick has already made considerable progress with the development of radio aids and auto-stabilization, Flight Director and Decca Track Guide equipment, and suitable approach lighting and angle-of-approach indicators for bad weather operation.

BRISTOL 192C. This is a proposed commercial version of the Bristol 192 now in production for the R.A.F., distinguished principally by its new centre fuselage section, incorporating 13 windows and up to 24 seats. The forward and rear portions of the helicopter, including the flight deck, engine bays, rotors, transmission systems and undercarriage, would be kept identical, so far as possible, with the military versions.

The Bristol 192.

The Napier Gazelle engines of the Bristol 192C are located at each end of the cabin, mounted vertically. A synchronizing shaft interconnects the two engines, keeps the rotors in proper phase relationship and permits either engine to drive both rotors in an emergency. Normally limited to 920 s.h.p., the Gazelles have a 2½-minute emergency rating of 1,650 s.h.p. for single-engined operation.

Bristol expect to be able to deliver the 192C early in 1961. Typical direct operating costs are given as 6.25d./seat-mile with full payload over 136 miles, or 8.5d. with 17 passengers, first-class, over 216 miles. It is calculated that the 192C would operate between London and Paris (centre-to-centre) at better than 12s. per aircraft mile, so that the return fare, to break even, on 65% load, would be about £22 14s.

Dimensions.—Rotor diameter (each) 48 ft. 11 in.; overall length, 87 ft. 1 in.; overall height, 17 ft.; total disc area, 3,760 sq. ft.; cabin dimensions (ex flight deck): length, 21 ft. 4 in.; max. width, 63.25 in.; max. height 67 in.; max. usable floor area, 94.2 sq. ft.; max. usable volume, 453 cu. ft.; volume of freight and baggage holds (two), 121 cu. ft.

Weights.—Basic operational, 11,717 lb.; total fuel, 2,624 lb.; max. payload, 6,000 lb.; max. take-off, 18,500 lb.; disc loading, 4.92 lb./sq. ft.; power loading, 10.05 lb./s.h.p.

Performance.—Typical cruising speed, 120 knots at 1,000 ft. at 16,000 lb., with 700 s.h.p. per engine and total fuel consumption of 150 Imp. gal./hr.; range with max. fuel (328 Imp. gal.), no reserve fuel, I.S.A. in still air, 233 naut. miles with 4,151 lb. payload at 120 knots at 1,000 ft.; range with max. payload, 70 naut. miles.

SIKORSKY S-61. Scheduled to fly next year and to be available for delivery early in 1961, the Sikorsky S-61 will be the largest commercial helicopter the company has produced, and is the largest single-rotor helicopter so far ordered by an airline. Three have been ordered by Chicago Helicopter Airways.

The S-61 has three General Electric CT58-100 gas turbines (produced by de Havilland as the Gnome) in an engine bay above the cabin and immediately below the five-blade rotor. The fuselage is in the form of a flying-boat hull of the type already used by Sikorsky on their smaller S-62 (THE AEROPLANE AND ASTRONAUTICS, October 2, p. 274), and the twin-turbine HSS-2 anti-submarine helicopter for the U.S. Navy.

Accommodation is provided for a maximum of 25 passengers

Right, the Vertol 107.

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in an airline interior with three-abreast (single and twin unit) seating, or 22 with a galley and toilet. The main loading door incorporates airstairs and there is an underfloor baggage hold. The main wheels retract into out-rigged stabilizing floats.

Dimensions.—Rotor diameter, 62 ft.; overall fuselage length, 57 ft. 8 in.; height, 15 ft. 4 in.

Weights.—Empty, 11,129 lb.; max. gross, 18,435 lb.

Performance.—Average cruising speed, 131 knots; range with full payload, 100 naut. miles.

VERTOL 107. Demonstrated in London in August, the Vertol 107, like the S-61, has a water-tight hull for amphibious operation, and is powered by General Electric CT58-100 (D.H. Gnome) engines. The engine layout contrasts with that of the Bristol 192, with the two engines grouped at the rear of the fuselage below the rear rotor, feeding in to a mixing gear box which drives the main and aft rotor shafts.

Normal accommodation is for 23 passengers, three abreast, with provision for up to 30 in a high-density layout. The forward door incorporates airstairs.

Vertol have a military version of the 107, the YHC-1A Chinook, in production for the U.S. Army, and offer commercial deliveries by 1960 at a cost, less engines, of £175,000.

The specification which follows is for the production version of the Vertol 107 with CT58 turbines (2½-minute rating 1,450 s.h.p., max. continuous power, 1,050 s.h.p.). The helicopter is also available with T58 engines having a 2½-min. rating of 1,250 s.h.p. and max. continuous power of 900 s.h.p.

Dimensions.—Rotor diameter (each), 50 ft.; overall fuselage length, 44 ft. 7 in.; overall height, 18 ft.; total disc area, 3,990 sq. ft.; cabin dimensions (ex. flight deck): length, 24 ft. 2 in.; max. width, 79 in.; max. height, 72 in.; max. floor area, 145 sq. ft.; max. usable volume, 935 cu. ft.; volume of baggage hold, 95 cu. ft.

Weights.—Basic operational, 11,246 lb.; total fuel, 2,754 lb.; max. payload, 6,640 lb., max. gross, 18,400 lb.; disc loading, 4.61 lb./sq. ft.

Performance.—Typical cruising speed, 135 knots at 1,000 ft.; max. range (170 Imp. gal. fuel, no reserves), I.S.A.+10° C., still air, 350 naut. miles with 4,400 lb. payload at 135 knots at 1,000 ft.

The A.T.A.C. Report

WHAT may prove to be the last annual report of the Air Transport Advisory Council was published earlier this month by the H.M.S.O. and covers the year ended on March 31, 1959. It is certain that, in the course of the next month or two, either the function of the A.T.A.C. will be taken over by a new licensing authority, or the A.T.A.C. itself will be given broader powers, in line with the Government's declared intentions (THE AEROPLANE AND ASTRONAUTICS, August 14, page 3). As this latest report again makes clear, the A.T.A.C. has had powers only to recommend a course of action to the former Minister of Transport and Civil Aviation.

In practice, in the 1958-59 year at least, an A.T.A.C. recommendation was as good as the law, for the Minister accepted all the recommendations made to him, in respect of 778 applications. The Council also took action, early in 1959, along the lines to be expected of the new authority, by refusing to consider applications to operate services by companies which had not satisfied the M.T.C.A. of their operational experience.

In the year under review, the inspection of operators' equipment and procedures and the examination of their detailed proposals for operating scheduled services was done by M.T.C.A. officers; in future, this task may also be taken on by the independent authority, which will have powers to license operators for scheduled services.

The A.T.A.C. has been meeting, on average, more than twice a week, to keep pace with the stream of applications from the independents to operate scheduled services in association with B.E.A. or B.O.A.C., inclusive tour services, vehicle ferry or freight services and—since June, 1958—circular tours (which the M.T.C.A. had previously dealt with direct). In the year, 940 applications were made; 77 were later withdrawn and by March 31, 778 recommendations had been made, including 354 approvals, wholly or in part.

Once again, inclusive tours made up the bulk of the applications—a total of 686. The report notes the continued tendency of operators to make applications very late and to apply for more tours than they really wished to operate. Of the applications, over 130 were withdrawn during or after consideration by the Council, which rejected 337 of these proposed services.

No significant increase in inclusive tour capacity was recommended for winter, 1958-59, or summer, 1959, because the recession of 1958 had prevented previously allowed increases from being fully utilized. However, enough information has now been obtained about the effect of inclusive tours on normal scheduled services to make it possible to approve a proportion of these tours for two or three years at a time.

The report records, as a "notable occurrence during the year," the submission by four companies of 27 applications to operate very-low-fare Colonial Coach services. The "prolonged discussion and consideration" of these applications was not completed in the period under review.

An example of the difficulties the A.T.A.C. sometimes has in protecting the interests of different operators was provided on the Dar-es-Salaam-Nairobi-Entebbe-London route operated by E.A.A.C. with Argonauts. This tourist-class service suffered, during the year, as a result of Hunting-Clan and Airwork introducing Viscounts on the Colonial Coach service to Nairobi—which then became both faster and cheaper than the E.A.A.C. service. The latter is now approved as a Colonial Coach service also, with maximum density seating in the Argonauts.

A short but interesting study of traffic development is included in the report. The table of scheduled service traffic by B.O.A.C., B.E.A. and the independents (below) justifies, the report says, the view that the operations of the independent companies have not to any material extent adversely affected the growth of the Corporation's traffic; but it is to be noted that the independents' share of the total has been steadily increasing. In the year 1958-59, provisional figures suggest the traffic of the independents on normal scheduled and internal services dropped, as the following passenger-totals show:

	1957-58	1958-59
Normal Scheduled ...	239,414	228,802
Colonial Coach and Coach	15,970	17,060
U.K. Internal	337,103	299,087
Inclusive Tour	137,416	180,446
Vehicle Ferry	173,524	224,929

The comparative figures for the internal routes (including passengers on vehicle ferries) can be broken down as follows:

	1957-58	1958-59
Channel Islands	210,005	186,691
Isle of Man	101,805	80,596
Other internal	37,793	31,800

Loads on vehicle ferries, on the other hand, increased substantially, with cars up by about 34% and freight more than doubled.

During the year, applications to operate scheduled services were received from five new companies—Tradair, African Air Safaris, Continental Air Services, Overseas Air Transport (Jersey) and Rotorports. The M.T.C.A. indicated that in general it would not be prepared to consider any company as suitable for scheduled service operators until it had at least 12 months' operational experience; a similar policy, presumably, will be pursued by the new licensing body.

LOADS TABLE

Year	B.O.A.C.					B.E.A.					Independent companies (scheduled services)				
	Passengers		Load short ton-miles			Passengers		Load short ton-miles			Passengers		Load short ton-miles		
		% of total	(×1000)	% of total	% change		% of total	(×1000)	% of total	% change		% of total	(×1000)	% of total	% change
1953–54..	290,156	13.2	136,068	68.9	—	1,656,779	75.4	53,119	27.0	—	252,550	11.4	8,100	4.1	—
1954–55..	281,373	11.1	133,343	63.9	− 2.7	1,874,316	74.6	63,039	30.2	+18.6	360,686	14.3	12,235	5.9	+51.0
1955–56..	371,215	11.8	155,758	60.6	+17.1	2,224,747	70.6	77,903	30.2	+23.6	552,326	17.6	23,453	9.2	+91.6
1956–57..	395,989	11.1	175,176	60.6	+12.5	2,461,065	68.7	88,828	30.7	+14.0	725,988	20.2	25,181	8.7	+ 7.4
1957–58..	459,144	11.0	189,645	58.6	+ 8.3	2,765,591	67.1	101,246	31.3	+14.0	903,427	21.9	32,548	10.1	+29.3
1958–59..	470,043	11.1	201,274	57.6	+ 5.8	2,828,715	66.6	108,598	31.1	+ 7.3	950,324	22.3	39,302	11.3	+20.8

The Fighting Services

Air Rank Appointments

GROUP CAPTAIN L. C. DENNIS is to become Director of Mechanical Transport at the Air Ministry in November with the acting rank of Air Commodore. At present Senior Equipment Officer at Headquarters, Transport Command, he was previously Director-General of Equipment.

Group Captain G. R. Wagill has been appointed Director of Operations (Bomber and Reconnaissance) with the acting rank of Air Commodore. Taking up his new post next month, Gp. Capt. Wagill until recently commanded R.A.F. Upwood. From 1955 until 1957 he was on the staff of Headquarters, Allied Forces, Central Europe.

Singapore Development

BETWEEN £2 million and £3 million is to be spent on the development of R.A.F. Tengah, the Far East Air Force base on the west coast of Singapore Island, into one of the finest jet airfields in the World. A new 9,000-ft. runway is to be built beside the existing 6,000-ft. strip capable of taking the latest types of Service aircraft. Hunter F.6s and Javelins are among the aircraft planned to be based at the station in the future.

Gannet Flying Trials

DURING its first nine weeks of operation No. 700 "G" Intensive Flying Trials Flight (Lieut. Cdr. W. Hawley, R.N.) has completed 742 hours' flying with the Fairey Gannet AEW.3. This total was logged by five pilots operating three aircraft over a total period of 45 flying days.

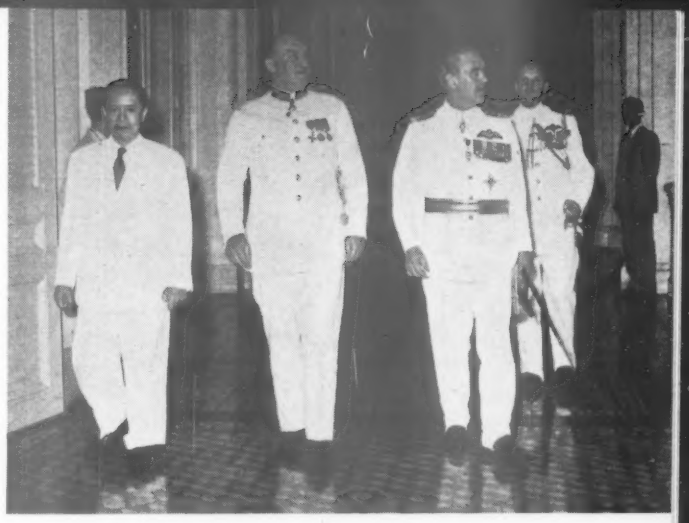
No. 700 "G" Flight was formally commissioned at R.N.A.S. Culdrose on August 18. Two production Gannet AEW.3s were delivered to Culdrose over the week-end of August 15-16 so that flying could start on the Monday. The unit was, therefore, flying three days before the first anniversary of the maiden flight of the prototype (August 20, 1958). In the first month, the flight completed a total of 337 hours with only two aircraft. The third machine was delivered on September 15.

R.A.A.F. Strength

IN a recent statement in the Australian House of Representatives, Mr. Townley, the Australian Minister of Defence, said the Commonwealth's three Services had "never been in such good shape in time of peace." He also gave details of their individual strengths in the third year of the three-year programme, but would not add details of the further three-year programme.

The operational R.A.A.F. at present comprises three G.A.F. Canberra B.20 squadrons, three Commonwealth CA-27 Sabre squadrons, two maritime reconnaissance squadrons of Lincolns and Lockheed P2V-5 Neptunes, three transport squadrons equipped with Douglas C-47 Dakotas, Convair 440 Metropolitans and 12 Lockheed C-130 Hercules, an air observation post flight, and five Citizen Air Force fighter squadrons of Mustangs, Meteors and Vampires.

The R.A.A.F. Sabre Wing in Malaya is to be equipped with Sidewinder AAMs in the near future. The total personnel strength of the Service is 15,750 officers and men.



VISIT TO SAIGON.—Air Marshal the Earl of Bandon, C.-in-C., F.E.A.F., recently visited Saigon. Here, left to right, are the President of the Republic of Viet Nam, His Excellency Ngo Dinh Diem; H.M. Ambassador in Saigon, Mr. R. W. Parkes; the Earl of Bandon; and Gp. Capt. F. Rothwell, Air Attaché in Bangkok.

R.A.F. Appointments

THE following are among recent Royal Air Force appointments:—

Air Ministry: Gp. Capt. C. A. Alldis, D.F.C., A.F.C., M.A., Gp. Capt. P. H. Cribb, C.B.E., D.S.O., D.F.C., Gp. Capt. D. S. Lindsay, O.B.E., D.F.C., Wg. Cdr. A. H. Hewitt, O.B.E., with the acting rank of Gp. Capt., and Wg. Cdr. B. Everton-Jones, M.A., to the Department of the Chief of the Air Staff.

Fighter Command: Gp. Capt. W. Pitt-Brown, D.F.C., A.F.C., to Headquarters as Senior Personnel Staff Officer.

Flying Training Command: Wg. Cdr. J. H. C. Dickie, O.B.E., to Headquarters as Chief Air Traffic Control Officer, and Wg. Cdr. M. D. Wylie, D.F.C., to Headquarters in charge of training.

Technical Training Command: Sqn. Ldr. W. Kent to R.A.F. Jurby to command the training wing, with acting rank of Wg. Cdr.

Signals Command: Wg. Cdr. J. H. I. Stirling to R.A.F. Norton to command.

Other Appointments: Wg. Cdr. R. H. G. Weighill, D.F.C., to the Imperial Defence College for Directing Staff duties; Wg. Cdr. V. C. Woodward, D.F.C., to the Ministry of Supply.

GANNET FLIGHT.—Members of No. 700 "G" Intensive Flying Trials Flight which has flown 742 hr. in 9 weeks in Gannet AEW.3s. Back row (left to right), Sub Lieut. M. A. West, Lieuts. P. A. Noice, D. J. Ellin, J. L. Hughes and B. Holdsworth, Sub. Lieut. T. G. Maltby, Lieuts. E. E. Eatwell, N. T. Bennett, D. F. M. Lucas, R. E. Coventry and M. A. E. Bland. Front row, Lieut. J. G. Randall, Mr. G. Richards (Bristol Siddeley), Lieut. Cdrs. S. R. Hirons, W. H. Barnard and W. Hawley (C.O.), Lieuts. A. A. B. C. Pettitt, E. J. Harris, J. L. Pickford and Mr. G. R. Lansdowne (Fairey Aviation).

Flying the Cessna 310C

by John Fricker

WHEN you step into the plush interior of the shapely Cessna 310, as I did at Blackbushe a week or two ago, it leaves you in no doubt that you are entering a luxury-class aeroplane for executive, charter or private use. The soft leather-covered walls of the cabin, with its wooden-panelled trim, and the leather and elegant matching fabric of the five foam-rubber upholstered seats, plus the thick floor carpeting and window curtaining immediately convey the board-room atmosphere. Coupled with its outstanding performance, this has made the Cessna 310 a best-selling business aircraft since its introduction in 1953.

Production began late in 1954, since when more than 1,000 have been sold, including 160 to the USAF for communications as the U-3A. As the newest variant, the Cessna 310C has two 260 b.h.p. Continental IO-470-D flat-six engines with fuel injection, instead of the 240 b.h.p. carburetted Continentals in the 310B.

Accompanying this change are modified exhaust augmenter tubes, extended in the upper engine nacelles to the wing trailing edge to avoid skin discoloration by the hot gases. Exhaust noise is carried aft of the cabin and sound-proofing is further improved by glass fibre-packed stainless-steel muffling boxes round the twin exhaust tubes, which have a modified cooling system.

The flat and very slim engine nacelles which are a prominent feature of the Cessna 310 design reduce powerplant drag to a minimum and contribute materially to the overall lift, while the effective aspect-ratio of the wing is enhanced by the fixed wing-tip fuel tanks. These house the main fuel supply of 86 Imp. gal., together with two-speed electrical auxiliary fuel pumps to maintain flow pressure independent of the engine pumps. Auxiliary internal wing tanks may be fitted outboard of the engine nacelles, with a total capacity of 25 Imp. gal. The outboard stowage of all fuel is a useful safety feature, but its inertia can be felt in the lateral control at low speeds.

The rest of the very clean all-metal airframe is conventional, although the surface finish and striking high-gloss paint schemes are much above average. The tough oleo-sprung nosewheel undercarriage is fully enclosed by fairing doors on retraction, and the long double step giving access to the single starboard entry door swings back into a fuselage recess at the same time.

The nosewheel is set as far forward as it can go for the longest possible wheelbase, and steers between 15 degrees each side of centre from the rudder pedals. Between 15 and 55 degrees, the nosewheel castors for tighter turns, with the aid of the Goodyear hydraulic disc-brakes on the mainwheels. At the max. gross weight of 4,830 lb., the undercarriage can absorb a rate of descent up to 9 ft./sec., the normal maximum landing weight being 4,600 lb.

At the upper weight, the 310C can carry five people, plus full fuel and oil and 303 lb. baggage and optional equipment. The baggage compartment is behind the rear seats with access from both inside and outside the cabin. Normal capacity is 200 lb., or 40 lb. per passenger. At 4,830 lb., the load factors of the 310C are +3.8 and −1.52, with ultimates of 150%.

U.K. distributors for Cessna are Airwork Services, Ltd., and after scaling the double step (which might prove slightly unpopular with feminine passengers) of G-APUF, the 310C demonstrator, I was shown round the cockpit by Sqn. Ldr. Joe Tyszko, the group's chief test pilot. The instrument panel and controls of the 310C incorporate functional grouping for rapid reference or access in a convenient layout.

With flight instruments on the left and engine gauges to starboard, the centre dash is available for additional radio, an ADF control box being fitted below the blind-flying panel. As usual, radio is supplied to customers' requirements outside the basic specification of the Cessna 310C, which is fitted as standard with a cabin roof loudspeaker and two 25-amp. engine generators for the 28-volt electrical system.

Dual control is also fitted, with comfortable cast-magnesium hand-wheels, and toe brakes on each set of rudder pedals. The central engine control console also houses individual trim wheels for elevators, ailerons and rudder. Both front seats move fore and aft for leg length adjustment; as with the rear bench seat, the backs are adjustable for reclining and head rests may be plugged into their tops. The seats are not quite as comfortable as feather beds, but the margin is small.

Talking of feather beds, an alternative seating arrangement for the Cessna 310 cabin features a two-seat divan along the port side of the cabin, using half the baggage space, and still allowing five persons to be carried. Further inducements to

The close-fitting cowling of the 260-b.h.p. Continental IO-470-D engines of the Cessna 310C are rapidly removable and provide maximum accessibility. The exhaust collector tubes are apparent in this view.

Photographs copyright "The Aeroplane and Astronautics"

In addition to the external baggage hatch, this photograph of the Cessna 310C shows the retractable foot-step, single entry door and exhaust ejector-tube muffler on the rear nacelle.

sleep while flying are the low noise level and provision for an autopilot. The Tactair T-3 10½-lb. pneumatic three-axis autopilot was recently certificated for the Cessna 310, which will also accept Lear or other similar units. The Tactair model, however, is claimed to be the only executive aircraft autopilot approved for single-engine operation.

View through the green-tinted windows is good except directly to the rear, and through a small arc blanked off by the engine nacelles. The steeply sloping windscreen is slightly far ahead of the pilot, but there is a hinged clear-vision panel on the left of generous size for bad weather operation. It also provided some much-needed ventilation on a typical 1959 summer day. For cooler conditions, a thermostatically controlled 35,000 B.Th.U. Stewart-Warner combustion heater is fitted as standard, and passengers also have individual ventilators. A further example of refinement are the separate electric cigar-lighters provided for front and rear occupants.

After releasing the car-type parking brake on the left, the Cessna 310 taxies effortlessly via its steerable nosewheel and toe-brakes. With four people on board at Blackbushe, neutral trims were selected, the auxiliary fuel pumps switched on, and 15 degrees of flap applied. The split flaps, like the undercarriage, are electrically operated and are infinitely variable, with an indicator dial on the panel.

On trying the controls for static friction, I noticed that the elevators appeared very heavy with aft wheel movement, apparently because of spring loading for low-speed stability and control. As flying speed is gained during take-off control feel is normal, and acceleration at full throttle power of 2,625 r.p.m. is very brisk.

It is possible to lift the Cessna 310 off the ground by firm backward wheel pressure at as low a speed as 65 m.p.h., but as the minimum control speed for asymmetric flying (Vmca) is 82 m.p.h., the best technique on a runway is to wait until that speed is achieved before unsticking. Some idea of how short a time is involved for this is indicated by the typical accelerate-stop distance of 2,500 ft., for a speed of 95 m.p.h.

The latter is safety speed for the Cessna 310, which after undercarriage retraction can be accelerated to the best single-engine climb speed of 111 m.p.h. At sea-level, and maximum weight, this gives a climb rate on asymmetric power of 440 ft./min., and at 119 m.p.h., the initial climb on both engines is nearly 2,000 ft./min. at a similar loading. Normally, however, a cruise-climb technique is used in which 75% power of 24 in. Hg. and 2,450 r.p.m. is set up after flap retraction, and 130-140 m.p.h. maintained to give a steady climb of about 1,500 ft./min., depending on weight.

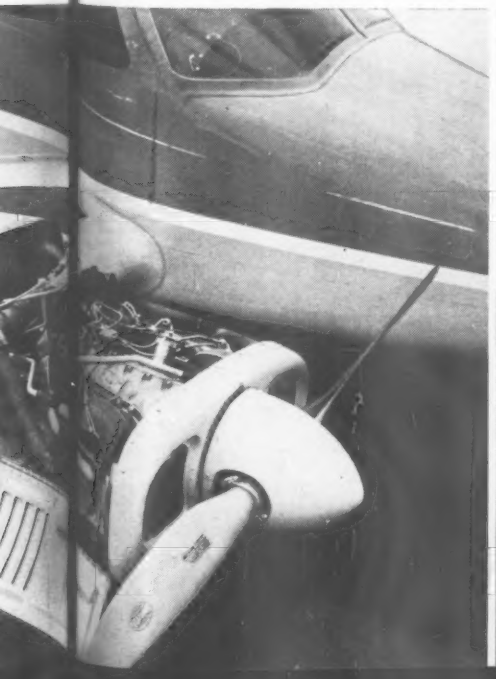
Even at the faster speeds, the angle of climb is still impressive, and the noise level remains gratifyingly low despite the high power setting. Clearing the Blackbushe area, we set off in the haze towards the Reading area, leaving the ADF tuned to point the way home throughout the flight.

Throttled back to 24 in. Hg and 2,400 r.p.m. for a relatively low altitude cruise, we settled down to an indicated 200 m.p.h. or so, which at the rated height comes somewhere near the optimum airspeed (220 m.p.h.) for 70% power. On its trans-Atlantic ferry flight, G-APUF, and its companion 310C, G-APVC, for the John Brown group, cruised at 196 m.p.h. T.A.S. at the economical power of 23 in. Hg and 2,300 r.p.m., using only 18 gal./hr. or so of fuel each.

In the cruising regime, the Cessna 310 is pleasant to fly, with fairly light and well co-ordinated controls, and good stability characteristics. Changes of trim are small throughout the performance range and, with the high standard of comfort, these handling qualities make for fatigue-free flying. Trimmer operation on all three control axes is precise and responsive, although little needed.

The Cessna 310 strikes one on initial acquaintance as being a good instrument-flying vehicle, and even the most drastic change of trim, resulting from asymmetric power, is easily coped with. Feathering is achieved by pulling fully back in succession the throttle, pitch and mixture levers, and then

Cockpit of the Cessna 310C has a functional layout of instruments and controls and is equipped for comfort as much as efficiency.



turning off the ignition. During the windmilling phase, a very moderate footload on the rudder pedals will check the yaw, and, after feathering, this can be completely cancelled by a couple of degrees of rudder trim.

The Cessna will then on one engine fly as happily as before and turns of medium to steep rates can be made in either direction without losing height. With the live engine at max. continuous power, the airspeed drops to about 140 m.p.h., and, on max. climb power, the 310 has a single-engine ceiling of 8,700 ft. at its fully loaded weight. Its asymmetric service ceiling increases by 425 ft. for each 30 min. of flight, becoming 10,900 ft. at 4,200 lb. all-up weight. As an irrelevant point of interest, illustrating its clean design, the Cessna 310 will cover 40 nautical miles from 20,000 ft. with both airscrews feathered, gliding at 107 m.p.h.

Re-starting in the air necessitates the use of the starter motor, with the engine controls set for low power until normal operating temperatures are regained. On throttling back both engines to check the low-speed performance, a fairly strong pull-force is needed on the wheel to keep the nose up, as one encounters the springs in the circuit. As the speed falls below about 100 m.p.h., the ailerons become slightly sluggish as the inertia of the tip-stowed fuel can be felt.

So although the stall breakaway does not occur until around 65 m.p.h. I.A.S., power-on, with gear and full 45 degrees of flaps extended (P.E.C. is then + 10 m.p.h.), the optimum approach speed remains in the region of 100 m.p.h. for comfortable control. In all configurations, the Cessna offers little natural stall-warning, but the indicator horn sounds quite clearly with about a 10 m.p.h. margin.

The stick-forces are deliberately made high to induce a stall, which happens at T.A.S. of between 84 m.p.h. clean, straight and level, and 119 m.p.h. in the same configuration at 60 degrees of bank. As one might expect, some of the stalls can be quite abrupt, but one must really work to achieve them, and recovery is straightforward for a moderate height loss.

Because of its high wing-loading, the Cessna 310 can be *g*-stalled fairly easily during the flare-out on landing, which is another reason for keeping a reasonable speed margin during the approach. The undercarriage can be extended at 140 m.p.h., with an accompanying slight nose-down trim, which is neatly cancelled out on lowering the first 15 degrees of flap.

Even at 95-100 m.p.h., the approach with full 45 degrees of flap is reasonably steep, and can be made power-off at that speed if required. The elevator is responsive for the flare-out, but I found slight difficulty in touching-down evenly on the mainwheels because of the reduced lateral control at the diminishing airspeed. The undercarriage oleos are pleasantly soft for landing, and the run is short enough, even without the use of brakes, not to prove embarrassing at some of our typical club airfields. A simulated overshoot from the approach configuration also proved very simple, with a very moderate nose-up change of trim.

In all, the Cessna proved an unexacting vehicle, despite its advanced specification, and fully bears out its manufacturer's claims for single-engine performance. In USAF service, the earlier Cessna 310B (U-3A) was found to average during its first year of service, an overall equivalent of £5 14s. per hour in direct operating costs, for an annual utilization of 840 hours. This is low for a five-seat executive aircraft, but ignores several factors which must be taken into account for civil operations.

When depreciation, based on a seven-year write-off, with 25% residual value, is introduced, for an initial aircraft price of £30,000, including I.M.C. Group I equipment, auxiliary tanks, airscrew anti-icing and dual control, the hourly cost for 700 hr. annual flying in Europe becomes £16.389. This also includes crew salary (£2.143), insurance (£1.8), hangarage (£0.153) and landing fees (£1), as well as maintenance (£1.393), overhauls (£2.208), fuel and oil (£2.411) and with four passengers brings the cost per seat-mile to 5.25d.

LEADING PARTICULARS

DIMENSIONS.—Span, 36 ft.; length, 27 ft. 1 in.; height, 10 ft. 5 in.; wing area, 175 sq. ft.

WEIGHTS.—Empty, 3,020 lb.; useful load, including fuel and oil, with auxiliary tanks, 1,794 lb.; max. gross, 4,830 lb.

PERFORMANCE (at max. weight).—Maximum speed, 242 m.p.h. at sea-level; cruising speed, 70% power, 220 m.p.h. at 8,000 ft.; best range speed, 44% power, 171 m.p.h. at 10,000 ft.; initial climb, 1,800 ft./min.; service ceiling, 21,300 ft.; max. range, with auxiliary tanks, no reserve, 1,440 miles; on tip-tank fuel, 1,110 miles; take-off to 50 ft., 1,395 ft.; landing from 50 ft., 1,720 ft.

Personal Flying

Variable currents at Denham, as printed in last week's Personal Flying column, may well have electrified our readers, in addition to giving the club concerned cause to wonder if it was AC or DC (actually D.C.G. is Wright for the C.F.I.). A fuse must have blown somewhere, however, to get current from a circuit, since the latter word was that intended. Our apologies to those left in the dark.

• • •

One of the biggest factors in the renaissance of club flying in Britain after the War was the supply, in large numbers, of ex-R.A.F. Tiger Moths at nominal prices. It was equally one of the greatest disservices that club flying could have received. It killed almost completely the demand for modern training aircraft; it led clubs to expect all their equipment for ever after at comparable prices, and it is wasting the time of nearly all our student pilots, who are learning to manipulate these curious contraptions of wire and canvas instead of getting on with the real business of being taught how to fly from A to B with safety and certainty within the modern air traffic control system.

Groping around in the murk without radio or instruments was all very well for the pioneers, but it is long past time for private flying in this country to leave the Peter Pan stage and grow up. It is neither practicable nor worth while to fit radio and other aids to the fugitives from the Science Museum which comprise the bulk of our flying club equipment, and it would advance the cause of personal flying by about 150% if all these veterans were piled together in an enormous heap and cremated on Guy Fawkes' night. We could then import some second-hand American light aeroplanes, and their lavish equipment, at quite reasonable prices and get down to some real flying.

On second thoughts, we might allow just one Tiger Moth to remain with each club as a reminder of the curious outlook we once had, and for the sake of their limited aerobatic capability. This is the only thing of ours the Americans envy.

• • •

Talking of importing light aeroplanes, we have mentioned many times in these pages the iniquitous 17½% duty imposed on such transactions in Great Britain. As if that were not enough, the Treasury calculates the duty not on the f.a.f. price of the product, be it aircraft or engine, but on the gross price, *including delivery*.

If this does not savour of sharp practice, nothing does. An acquaintance of ours is even now battling with H.M. Customs, who are endeavouring to extract gross duty on a foreign aircraft which he delivered himself.

Several European countries, including West Germany, have no import duty at all for foreign aircraft. Others, such as Denmark, pay only 7% or so, which also applies to Australia. If our 17½% is intended to protect the aircraft industry and encourage it to produce light aeroplanes for personal flying, it is obviously ineffective. If it is simply to soak one section of the community for the benefit of the Treasury, it is immoral. In either case, it is hampering the growth of business flying, and therefore of business efficiency, and should be substantially reduced, or removed altogether.

BUSINESS AMPHIBIAN.—One of the last departures from Croydon before it closed on September 30 was this American-registered Convair PBY-5A Catalina amphibian, which is furnished for executive use.

Photograph copyright "The Aeroplane and Astronautics"

Book Review

THE CROWDED SKY—An Anthology of Flight. Edited by Neville Duke and Edward Lanchbery. 421 pp. 6¼ in. by 10 in. Cassell. Price 30s.

HUNDREDS of years ago a Chinese philosopher wrote about a bottle that the most important thing is not its shape or colour but the space within it. Much the same might be said of an anthology. Bottle and anthology are both functional. Their contents should be likewise so.

The editors of "The Crowded Sky" have endeavoured to be historically functional from the time of Leonardo da Vinci to the present day. But they would need a larger bottle or a change in contents to succeed in this.

Personally I like and have long appreciated many of their selected tales and poems, drawn from sources as diverse and esoteric as da Vinci, Lunardi, Cody, Santos Dumont, the Wrights, A. V. Roe, C. G. Grey, Fokker, McCudden, Baring, Bewsher, Stephen Spender, C. Day Lewis, Sam Hoare, Guy Gibson, Clostermann, Murchie, Saint-Exupéry, Galland, Yeager and others. No doubt readers will enjoy picking up and dipping into this book as folks enjoy bran-tub dips at the village church fête, which always have something that once belonged to someone else worth pulling out. But, as in the bran-tub, lots of things cannot be pulled out.

Where, for instance, are the immensely important contributions of the floatplane and flying-boat? Marine aircraft are here portrayed by only two rather unsuitable episodes, Ellsworth's and Amundsen's Dornier Wal Arctic exploration, and the Lindberghs' difficult take-off from Bathurst in an unwilling American floatplane. No word appears of the long line of famous British seaplanes and their triumphs.

So far as this book is concerned, the Battle of Britain never happened. Why? Surely an extract from Richard Hillary could have covered that?

Autogyros, helicopters, the masterly flights of civil airline pilots (with St.-Ex's famous exception), thrills of the Schneider Trophy contests, where are they? Not here! Again why? Perhaps a letter in "*The Times*" *Literary Supplement* for October 9, 1959, discussing the pros and cons of royalties for editors and authors in anthologies might provide a clue to the reason for the gaps.

The airship is (I think) overflown in these pages, thus making the overall selection appear yet more partial. One finds the same tendency in sectional selection. For example, all but one of the choices concerning test flying fall into the post-parachute period and nine of the 12 deal with reaction propulsion aircraft. A different filling of the bottle would have avoided this palate-cloying similarity.

Either the editors did not see or seek, or someone would not pay, to fill the blind spots; or the missing links have never been adequately written about, which is not so. Thus the sub-title—"An Anthology of Flight"—which leads one to expect to sample all aspects of historical flying, is an inexact description. But if the reader cares to forgive and forget both the gaps in and the over-emphasis on some periods and kinds of flying, he will enjoy most of what he finds here.

Among trivia: Magee's poem appears in a section named "Wings of Peace," but, in fact, it was written in wartime. The authorship of the "Diary of an Unknown Aviator" is unstated, although Elliott White Springs, who wrote it, only died in America last week. I would have preferred this to have been mentioned by the editors. And in the reprint which the book deserves I hope they will reinstate "Meckstall Smith" into the real man "Heckstall Smith."—NORMAN MACMILLAN.

Seaplanes—an Invulnerable Deterrent?

SO little has been heard during recent years of the seaplane either in the military or civil field, that to find it given a vital place in a study of "optimal" strategy for the U.S. is bound to be surprising. The case for the seaplane is made in the course of a complex argument regarding means for providing the U.S. with an invulnerable retaliatory force. Why this striking force must be placed on the oceans of the World, in the oceans and in the air above them, is set out in an article by Oskar Morgenstern in the September issue of the U.S. business magazine *Fortune*. Dr. Morgenstern, in collaboration with the late John von Neumann in 1944, wrote "The Theory of Games and Economic Behavior." His forthcoming book, "The Question of National Defense," is to be published in the U.S. next month by Random House.

The theory put forward by Dr. Morgenstern in *Fortune* is provocative and is certain to bring about much furious argument, whether his case for the "Oceanic System" is ultimately accepted or not by the highest U.S. planning authority. Having made his case for dispersing the main U.S. retaliatory power all over the World, hiding it in the depths of the oceans in order to be able to strike from mobile bases, the locations of which are constantly changing, he deprecates the use of the large aircraft carrier. "The large carrier is dying before our eyes," he writes. He then states unequivocally that the carrier's former rôle in war will be assumed by the submarine and seaplane. Both, he says, will take their strength from nuclear propulsion and nuclear weapons.

It is interesting to recall against this background that some time ago lengthy negotiations were initiated to make available the Saro Princess flying-boats to the U.S. Navy for experiments with nuclear powerplants. However, the flying-boat as such is not specifically mentioned, only the general collective term "seaplanes."

Dr. Morgenstern adduces the ability of the seaplane to dispense with runways as an example of how such marine craft can be used to render unnecessary the fixed, and therefore highly vulnerable base. The nuclear-powered seaplane has to be replenished with crews and weapons and food, but this can be done from ships.

In discussing the feasibility of the Oceanic System, its author says that the principle can be expressed in two forms: first the fleet ballistic missile fired from submarines now over distances up to 1,500 miles; second, the nuclear-propelled seaplane supported on the oceans from submarines acting as tenders (or from surface tenders at great distances from the Russian and satellite coasts).

The first part of the system is Polaris, which is in a modest state of development, and at present no operational units have been fitted with missiles. The second part of the system involves the use of nuclear-powered seaplanes, supported by ships or submarines. It is interesting that the author, as we have said, does not specifically call for a flying-boat—perhaps he foresees that the application of some such principle as that employed in the Hovercraft might make the use of a vee-bottom stepped hull no longer necessary.

Be that as it may, Dr. Morgenstern argues that nuclear-powered seaplanes would have practically unlimited endurance, ability to fly very low without wasting fuel (unlike existing types of turbojet), they would be able to alight on water, which forms just over three-fifths of the Earth's surface. The author argues that they could always find quiet water without running out of fuel (on the other hand, effecting a rendezvous with refuelling ships in quiet water might not be easy to arrange). He considers that nuclear-powered seaplanes could not only carry air-to-ground missiles, i.e., the stand-off bomb, but also ballistic missiles.

It is understandable that seeing so clearly the advantages of the nuclear-powered seaplane, the author of the article is concerned about the slow progress made with the development of nuclear propulsion for aircraft. The U.S. programme for such work, in his opinion, has a very bad, confused record, beset by on-again, off-again decisions; he states categorically that about $900 million has been wasted. He has no doubt that a safe nuclear-powered seaplane can be developed. He considers that in addition nuclear-powered seaplanes would be specially suitable for cargo-carrying purposes in his Oceanic System.

As the British ballistic programme is so far behind that in the United States, the idea of developing a solid-fuel missile capable of being launched from a nuclear-powered submarine is not likely even to be considered by planners in this country. And, indeed, they are not likely to worry much about developing the nuclear-powered seaplane.

As we have said, Dr. Morgenstern does not concern himself with what sort of seaplane should be developed for nuclear power. All published discussion on this subject has assumed that very large aircraft would be needed owing to the weight of shielding necessary for the nuclear reactor. It was for this basic reason that the suitability of the Princess was put forward for nuclear-propulsion experiments since the designed all-up weight of this flying-boat was to be around 300,000 lb.

Over the years quite a useful amount of experience has been obtained in the design and development of seaplanes and flying-boats by specialist firms in our aircraft industry. As a first step it would seem to be worthwhile inviting Dr. Morgenstern to enlarge on his ideas before the Royal Aeronautical Society or similar body. There might well be an opportunity in collaboration with the U.S. for useful development work with British flying-boats as a first step towards nuclear-powered seaplanes for the Western World.

Astronautics and Missiles

Soviet Moon Probes: What Next?

SINCE the launching of Lunik II on September 12, Russian scientists have been rather less reticent in discussing their future plans for space-research. At least, an increasing number of statements are now appearing in Soviet newspapers and magazines which seem to reflect the trend of Soviet ambitions, although it would be unwise to accept any of them as being official statements of policy. Nevertheless, where statements and interviews are given by members of the U.S.S.R. Academy of Sciences, they are usually authoritative, though invariably lacking in detail.

Interplanetary Probes

On October 9, for example, Professor G. I. Pokrovsky was interviewed by *Tass* on the ability of Soviet science to launch heavy payloads to the Moon. He remarked that "previous achievements of Russian space-rocketry have made possible the development of exceptionally powerful carrier rockets, capable of boosting a payload of more than a ton into cosmic space, within the Solar system, between the orbits of Mars and Venus." He said that the development of a very powerful and lightweight rocket engine was one of the key factors in Soviet space achievement to date.

To have any chance of fulfilling their stated plan of landing men on the Moon by 1966 (THE AEROPLANE AND ASTRONAUTICS, October 9, 1959, p. 319), the Russians clearly have a long way to go despite recent successes with unmanned probes. Undoubtedly, much work remains to be accomplished with purely automatic equipment, including probes which both orbit and land on the Moon.

The next step, according to the Soviet Press, is "the establishment of an automatic laboratory on the surface of the Moon." This would permit a big extension of the research opportunities and might even permit seismic investigations of the Moon's interior to be carried out. It would also be possible to land a radio marker beacon, allowing subsequent landing vehicles to home on the signals for the accurate grouping of research equipment and, eventually, to build up supplies prior to a manned expedition.

There has been much evidence of Russian interest in remote controlled vehicles in the literature of late, and as long ago as 1956 Yu. S. Khlebtsevich put forward what must surely be the ultimate in automatic exploratory devices. His suggestion was that a "tankette laboratory" might be developed which, after being landed on the Moon by an unmanned probe, would emerge from the carrier vehicle and crawl upon the lunar surface.

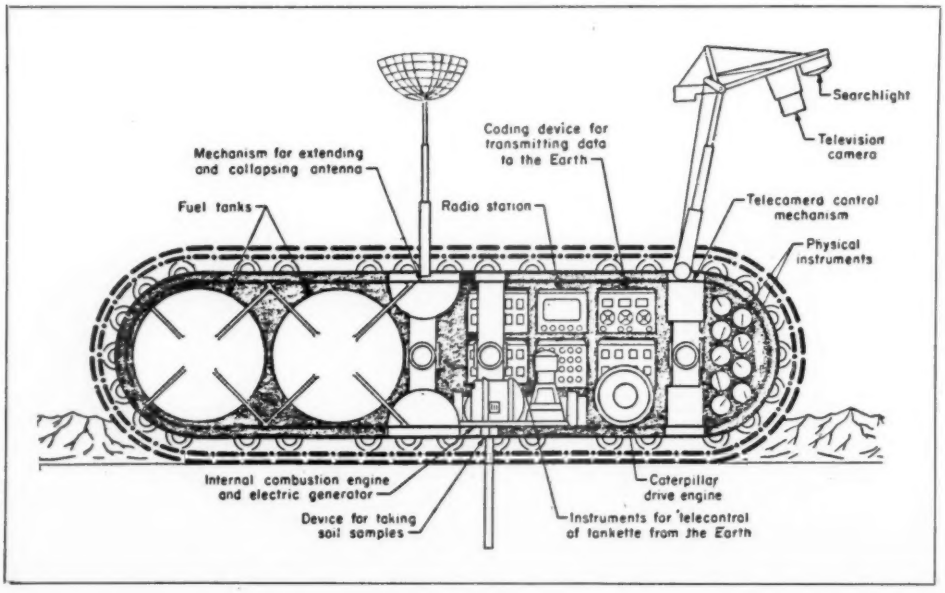
ASTRONAUT.—At least three Russians are under space-flight training at present. Seen here wearing a pressure suit is Alexei Grachev, who is receiving final instructions before a simulated mission—presumably in a centrifuge.

At the time, the scheme was dismissed by most Western observers as fantasy. After all, no one had yet managed to launch even a small artificial satellite, and the thought of sending a small tank weighing "hundreds of kilograms" to the Earth's natural satellite was quite ludicrous.

Today, with three major Soviet Moon-probe successes behind us, the scheme appears less fanciful, although no one would suggest that its execution would not raise some very difficult problems.

In Khlebtsevich's words, "The tankette . . . will be controlled by radio from the Earth. The transmitting TV camera, mounted on a radio-controlled boom having several degrees of freedom and fixed to the tankette, will permit scientists on Earth to observe the lunar surface and the lunar sky with the disc of our planet visible in it, and to determine the safest path for the movement of the laboratory. Aboard it will be placed various automatic instruments transmitting to the Earth their readings on the state and properties of the lunar atmosphere and the lunar surface.

"For moving the tankette laboratory and operating its equipment the necessary store of fuel and oxidant for the engine will be available. . . . Calculations show that for a tankette weighing no more than several hundred kilograms, serious investigations of the Moon, sufficient for carrying out


Searchlight
Television camera
Coding device for transmitting data to the Earth
Mechanism for extending and collapsing antenna
Fuel tanks
Radio station
Telecamera control mechanism
Physical instruments
Internal combustion engine and electric generator
Caterpillar drive engine
Device for taking soil samples
Instruments for telecontrol of tankette from the Earth

Unmanned laboratory proposed by the Soviet scientist Yu. S. Khlebtsevich in 1956 for exploring the surface of the Moon. (From "Behind the Sputniks," edited by F. J. Krieger, Rand Corporation.) It would be completely automatic in operation and remotely controlled from the Earth.

the next stage—the conquest of the Moon by man—are possible in principle; and what is more, in the case of necessity, it will be possible to land other tankettes, taking into account the results obtained earlier."

It was also pointed out that the use of radio-telecontrolled tankettes as "first investigators" would greatly simplify the construction of the multi-stage launching rocket. In comparison with a manned vehicle, automatic devices can withstand considerably greater acceleration stresses and temperature variations; and, most important of all, it would be possible to have both tankette and carrier rocket on the Moon without giving a thought to recovering them. This greatly simplifies the problem, for not only will the launching rocket have smaller mass, and correspondingly less thrust, but the difficult problems of take-off from the Moon and recovery through the Earth's atmosphere are eliminated.

Interplanetary Stations

Despite the emphasis on large rocket engines, and the hint of clustered units being used in future space-projects, Soviet scientists still talk a good deal about space-stations as staging centres for manned space-flight.

In a *Tass* interview on October 12, academician Ari Sternfeld said that "Orbital vehicles—interplanetary stations such as the one which rounded the Moon but several times larger—will cruise in the depths of space regularly, passing periodically in the vicinity of the Earth. These artificial cosmic bodies might be used as stepping-stones for journeys between our planet and the Moon."

Sternfeld felt that men on such a station, on a properly planned orbit, would be able to approach the Moon 13 to 14 times a year, with the Moon in a different phase each time. "Every two weeks," he said, "the space travellers will be able to descend from the orbital vehicle to the Earth. At the same time, various supplies, such as food and air, will be delivered to the space-vehicle. It would be possible to stabilize the orbit of an interplanetary station of this kind by means of miniature rocket motors." In Sternfeld's opinion, it might even be possible to develop "an automatic, unmanned, interplanetary station to refuel rockets departing on interplanetary flights."

Dogs and Men

So much for the proposed mechanics of Soviet astronautics. Also this month has come news of the men Russia is training for future space-experiments. So far, three names have been given, but undoubtedly there are more; they are Alexei Belokonev, Alexei Grachev and Ivan Kachur. News of their activities was given last week in two Russian magazines, *Soviet Union* and *Ogonyok*.

TOP DOGS.—Russian dogs wear pressure suits for high-altitude rocket flights. Here the animal on the right is fully-clad in pressure suit and helmet—the pipe from which is presumably for oxygen supply.

Alexei Belokonev is said to have been a "guinea-pig" in a series of experiments intended to discover the effectiveness of pressure-suits in dealing with sudden decompression of the spaceship cabin, as in the case of puncture by a large meteorite. One demonstration, characteristic of similar experiments carried out in the United States, involved placing a glass of water in front of the suit-clad Belokonev, suddenly decompressing the chamber, and watching the water in the glass boil. Had the Soviet "spaceman" been unprotected, the same would have happened to his body fluids.

Research is also continuing with dogs, one of which was apparently put into a pressure chamber without space-suit protection. When the chamber was decompressed the dog's skin is said to have separated from its flesh by several centimetres (sic) and its blood started to boil, but when pressure was restored the skin returned to its normal condition and the animal was revived. The animal is described as being "none the worse for its experience," and afterwards is alleged to have eaten a big meal.

Medical opinion here suggests that an experiment of this kind might be possible if (a) the decompression was carried out relatively slowly, and (b) the "no pressure" condition pertained for only a short period before pressure was again slowly restored. It was then likely that the body tissues would not be torn.—K.G.G.

Progress with Scout

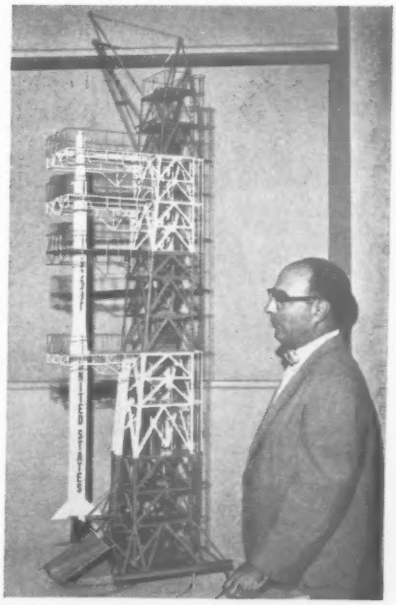
INFORMATION from the United States suggests that the first payload launching of the Scout four-stage rocket, which Britain has contracted to use for orbiting satellite equipment in 1961, will take place next summer. A three-stage test version may be fired earlier.

The vehicle is designed to establish nominal payloads of 150 lb. at altitudes of 300 miles, or alternatively, as a high-altitude probe, it will send a 100-lb. instrument package some 5,000 miles into space. Present intentions are to use the vehicle for space, orbital and re-entry research. A complete breakdown of the project, including an exclusive cut-away drawing, was given in THE AEROPLANE AND ASTRONAUTICS, June 19, 1959, pp. 699-700.

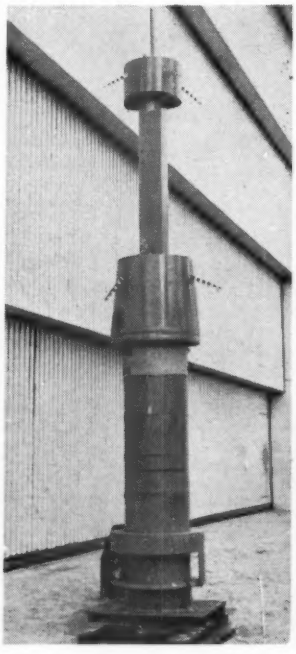
Work on the rocket and its launching equipment is well up to schedule. The launching tower, built at Chance Vought's factory at Dallas, Texas, this summer, has now been dismantled and shipped to the NASA Wallops Island test facility off the Virginia coast.

Before the tower was taken down a dummy rocket consisting of empty rocket cases was prepared in order to check it. The first two stages consisted of expended Senior and Sergeant motors supplied by the respective manufacturers, Aerojet and Thiokol; stages three and four were built by the Allegany Ballistic Laboratory.

Since the removal of the tower, the dummy Scout has itself been dismantled and is now undergoing static tests in Chance Vought laboratories, while the actual prototype is being fabricated in the experimental workshops. To assist this work, mock-ups have been made of the instrumentation bay, the telemetry antennae, and also the rocket's nose fairing and ejection mechanism. Development is also being carried out



Mr. M. Green of Chance Vought's projects department inspects a scale model of the Scout and its launching tower.



Above, a test dummy of the Chance Vought Scout on the 109-ft. launching tower. Centre, mock-up of the fourth-stage instrument bay and telemetry antennae. Right, technicians prepare Scout's nose fairing for an ejection test.

on the vehicle's ballistic H_2O_2 controls, and the exhaust vane system for stage one. The guidance package, to be located in stage three, is being supplied by Minneapolis-Honeywell.

As the accompanying pictures show, the vehicle can be mounted in a vertical position in the launcher for preparatory operations before firing; launching can be made at any angle between 90 and 70°. Four platforms on the tower provide space for technicians to work on during pre-firing operations. Designed and built by Chance Vought's structures laboratory, the 60-ton, all-steel launching tower measures 21 ft. by 23 ft. at the base and is 109 ft. tall. It can be swivelled through a range of 90° with an accuracy of ¼°.

Located on top is a hoist capable of lifting 3,000 lb.—sufficient to raise Scout's two upper stages into position. Also incorporated is a personnel lift with a 1,000-lb. capacity. In view of the use of hydrogen peroxide for the vehicle's gas-jet controls, three water sprays are provided on the tower for cleansing purposes.—K.W.G.

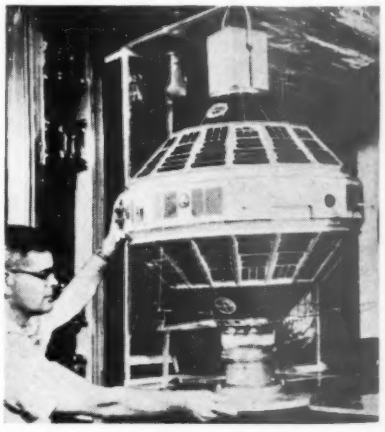
Explorer Number Seven

ON October 13 the U.S. launched the seventh of its Explorer satellites from Cape Canaveral. The launching vehicle was an A.B.M.A. four-stage Juno 2 similar to that which launched Pioneer 4.

Explorer 7 is a 91½-lb. spin-stabilized "gyroscope" satellite with most of its equipment disposed around its central rim. Its planned apogee is 700 miles and perigee 350 miles. Its track fluctuates 50° on each side of the Equator.

This satellite will transmit information on the Earth's radiation belts. It will also measure the heat radiation of the Sun and Earth, micro-meteorite damage and the transfer of radiated energy from the Earth's lower latitudes to its upper latitudes by the atmosphere and ocean currents.

It is expected to remain in orbit for at least a year. After 12 months its radio transmitters, which are supplied by solar cells, will be turned off automatically to free the radio channels.



SATELLITE.—Calibration tests of the Explorer 7 satellite were made in a low-temperature vacuum chamber.

Pioneer 4 Reaches First Aphelion

THE United States space probe, Pioneer 4, which was launched from Cape Canaveral on March 3, reached its aphelion—or farthest point from the Sun—on October 8, at a distance of 107,951,000 miles from the Sun and travelling at 59,848 m.p.h. relative to it. The Army Ballistic Missile Agency and NASA's Jet Propulsion Laboratory were responsible for launching Pioneer 4, which was the first successful U.S. space probe. It has also been called Juno 2, but this name is now given to the Jupiter-based vehicle which launched it.

Chemical batteries which powered the transmitters in the 13.4-lb. cone-shaped payload went dead 82 hr. 4 min. after the launch. At that time, J.P.L's Goldstone tracking station—an 85-ft. diameter antenna in the California desert—lost the signal when the probe was 407,000 miles from the Earth and well beyond the Moon. This distance represents a new tracking record. When the signals from the Pioneer 4 ceased, its speed was above Earth escape velocity and it went into orbit around the Sun.

Accurate details of this orbit have now been given by NASA. The probe's perihelion (closest point to the Sun) was on March 18, when it was 91,720,000 miles distant and travelling at 70,440 m.p.h. relative to the Sun.

Its orbit around the Sun will take 406.95 days, at an average orbital speed of 65,144 m.p.h. At perihelion its distance inside the average Earth orbit is 1,236,000 miles and at aphelion its distance outside the Earth orbit is 14,995,000 miles.

Comparable figures for the Russian probe Mechta, launched into orbit on January 2, are:—Perihelion, January 14, 91,100,000 miles; aphelion, August 21, 120,000,000 miles; period of orbit, 443 days; average speed in Sun orbit, 63,100 m.p.h. Russia has now launched three successful Moon probes and the U.S. one; the next U.S. attempt is expected in late November.

American-in-Space Progress

AT a recent NASA Press conference in California, news was given of progress with Project Mercury, the U.S. man-in-space programme. Six of the "Mercury astronauts," chosen to man the space capsule, spoke of their contributions to the programme.

Project Mercury is under the direction of the NASA Space Task Group. The U.S.A.F. Ballistic Missile Division will be responsible for launching the capsule, for guiding it into orbit, for developing a system for its recovery if the launching is abortive, and for tracking the capsule and communicating with it. Recovery of the capsule will be the task of the U.S. Navy.

The Mercury capsule will be launched from Cape Canaveral by an Atlas booster. Produced by McDonnell, the capsule has an escape rocket system which will raise it high enough for parachute recovery if the booster fails during the launch. On entering orbit the capsule will separate from its booster and the escape "tower" will be jettisoned.

At this point the capsule's stabilization system—which uses three-axis reaction control jets almost identical to those of the X-15—will turn the capsule through 180°. Its blunt heat-shield will thus be made to travel foremost and the capsule's attitude will be maintained constant relative to the Earth.

Initial plans call for the capsule to make three circuits around the Earth at a height of 100 miles before its retro-rockets are fired and it makes a ballistic re-entry. The descent will begin over the Pacific and the actual landing will be made in the sea off the Bahamas. The whole operation will take about four and a half hours.

The whole mission will be pre-programmed and under automatic control, so that the astronaut can be a pure passenger if necessary. But when in orbit he will be able to cut out the automatic stabilization system and attempt manual control of capsule attitude. He will also be able to observe the ground through a periscope and check on the capsule's position, although he will be powerless to make any course corrections.

The astronaut will wear a ventilated pressure suit, but in addition the capsule will be pressurized to give an effective altitude of 27,000 ft. and will also be cooled to withstand re-entry heating. During launching and re-entry accelerations and decelerations of up to 8 or 9g will be experienced, but peak g will be maintained for only 10 to 15 sec. After re-entry the capsule will land in the sea supported by parachutes; deceleration on impact will be 18 to 20g.

Pilot training for the programme includes simulated control of the capsule when subject to high g in a centrifuge. Each of the astronauts has been given a special aspect of the project to study. These include tracking and recovery; life-support within the capsule; the flight-control system and autopilot; cockpit layout; ballistic flights of the capsule mounted on Redstone; and communications and navigation.

The programme is on schedule; Little Joe flights have been made to check the abortive-launch system and one launch has been made with Big Joe. In this the capsule was launched by an Atlas and recovered successfully after withstanding velocities near those which will be experienced in re-entry from orbit.

Sub-orbital flights will be made by the astronauts in capsules launched by Redstones. Launches with unmanned capsules and with others carrying animals will be made initially; the total number of Redstone launches will depend on the success of the early ones. No date for the first manned Mercury flight has been announced, but one U.S. report suggests it will be near the end of 1960 if there are no big setbacks.

Propulsion for a Manned Moon Landing

BASIC differences between the propulsion of space vehicles and aircraft were discussed in a recent Canadian Aeronautical Institute paper by Mr. A. M. Rothrock of NASA. He also examined propulsion systems proposed for space missions which included the landing of a manned vehicle on the Moon.

Missile and space missions were defined in terms of the change in vehicle velocity to be effected by the propulsion system. Approximately, these were 9,500 m.p.h. for an IRBM with a range of 1,500 n.m.; 16,000 m.p.h. for a 5,500-n.m. ICBM; 17,000 m.p.h. for an Earth satellite; and 24,000 m.p.h. for a one-way Moon probe.

Potentialities of future chemical, nuclear and electrical propulsion systems were considered in the paper; in an accompanying table, their characteristics are compared with those of the turbojet engine. Inevitably, some of the information is speculative.

For chemical rockets, the power generation device is relatively light, less than 10% of the total rocket stage weight. The nuclear rocket will have a power-to-weight ratio of about 35 horsepower per pound, but the picture is less clear because of uncertainties about the shielding required and operating temperatures.

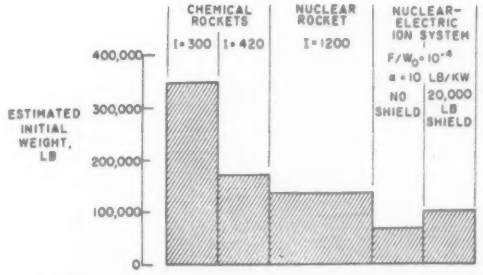
Electric propulsion systems present a definite problem because of the weight of power generating system. The electric power required will probably be generated from nuclear energy. If the system weight is assumed to be 10 lb. per horsepower of electric energy generated and transferred into jet power, the powerplant weight per lb. of thrust generated is 4,000 lb.

Further, assuming a powerplant weight of 40% of the gross vehicle weight, the ratio of thrust to gross weight is 0.0001. With this thrust/weight ratio the electric system is suitable when the gravitational forces on the vehicle are of this order or less, or when sufficient velocity has already been imparted to the vehicle to offset any gravitational force.

COMPARISON OF AIRCRAFT AND SPACECRAFT PROPULSION SYSTEMS

	H.P. per lb. thrust	Engine wt.-lb. per lb. thrust	Specific Impulse lb. thrust/ lb. prop./sec.
Turbojet	2	0.30	60*
Chemical rocket	12	0.015	360
Nuclear rocket	28	0.045	840
Elec.-mag. rocket	330	1,000 to 5,000	10,000

*3,600 lb./lb. fuel/sec.



VEHICLE FACTS.—Initial weights are shown for a vehicle with an eight-man crew which would make a round trip to the Moon, starting from and returning to an Earth orbit. Basic payload is 10,000 lb. and landing and exploration equipment 16,000 lb. The advantage of a propulsion system with a high specific impulse is evident.

The influence of propulsion systems on the weight of space vehicles was also considered. Estimated gross weights are given on this page for a vehicle which will travel from an Earth orbit to land on the Moon and return to an Earth orbit afterwards. In the case examined the weight returned to Earth orbit is 10,000 lb. The vehicle velocity change for the mission is 25,000 m.p.h.

The specific impulse values, in lb. thrust per lb. of propellent per second, are listed for the thermal rockets. A thrust-to-weight ratio of 10^{-4} and a powerplant weight ratio of 10 lb. per kilowatt are specified for the nuclear-electric system.

The data indicate the saving in gross weight that may be attained with either the chemical high-energy propellent (specific impulse 420 seconds with propellent velocity approximately 9,000 m.p.h.) or with nuclear systems, compared with the use of current chemical propellents.

Initial weights listed are those required in an Earth orbit at the start of the mission. Since the weight differences between the high-energy chemical and the nuclear system are reasonably close, the choice will depend largely on the development status of the two systems. Because of the low thrust-to-weight ratio with the ion system, the acceleration time to leave the Earth orbit would be of the order of 50 days. For this reason such a system will probably not be considered for a Moon-landing vehicle.

Astronautics and Missile News

TRYING AGAIN.—An attempt to place a 370-lb. "probe" into orbit around the Moon using an Atlas-Able launching vehicle is scheduled to be made during the four-day period beginning on November 28. The attempt was originally planned for October 3-6, but the rocket exploded during a static test on September 24.

MOON PICTURE.—Russia announced on October 18 that pictures had been successfully obtained of the hidden side of the Moon. "The results of the scientific measurements and photographs are being processed and will be published," *Tass* reported.

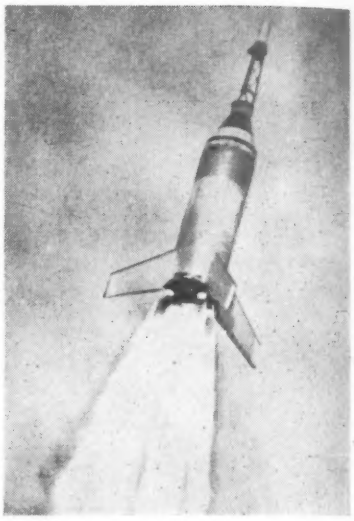
PROJECT ECHO.—NASA's passive communication satellite programme using inflatable metallized spheres has been designated Project Echo. The American Telephone and Telegraph Co. will be responsible for conducting satellite communication tests.

SPUTNIK III.—Originally expected to disintegrate in the atmosphere in August after about 15 months in orbit, Sputnik III is now estimated by the Smithsonian Institute to remain in orbit until about December 3. During its lifetime, the satellite's apogee has shortened from 1,167 miles to 720 miles, its perigee from 135 miles to 128 miles, and its period from 106 minutes to 98.09 minutes.

NUCLEAR ROCKET.—NASA is negotiating a three-year contract with the Lockheed Aircraft Corp. for feasibility studies of nuclear rocket propulsion. Lockheed will test components by subjecting them to radiation and extreme cold.

MORE FOR AMMs.—A swing-over in spending from anti-bomber missiles to anti-missile missiles was foreshadowed in a Congress proposal this summer. The U.S. Administration recommends that bomber defence budgets should be cut by $1,500 million and missile defence spending increased by $150 million.

CONSOLATION. — Russia is obviously leading the United States in space research rocketry, but "our position in intercontinental missiles is just not near as bad," said Dr. York, U.S. Defense Department research director, following the launching of Lunik III.



MERCURY TEST.—With a Mercury test capsule "up front," Little Joe leaves the launching pad at Wallops Island, Virginia.

General Aviation News

MAN - POWERED FLIGHT. — The inaugural meeting of the Royal Aeronautical Society's Man-powered Aircraft Group will be at 4 Hamilton Place, W.1, on October 30, at 7.30 p.m. The theory and practice of man-powered flight will be discussed.

NEW F.A.I. RECORDS.—Among the international records recently homologated by the F.A.I. is the new height figure of 28,852 m. (94,657 ft.), achieved by Vladimir Ilyushin in a T-431 aircraft, powered by a 9,000-kg.-thrust turbojet, on July 14. Flying from Podmoskovnoi airfield, he held the peak altitude for some five minutes, in contrast to the zoom technique of the previous American records. Another Russian height record is that of 20,456 m. (67,112 ft.), with a payload of one tonne, achieved by V. Smirnov in an RV aircraft, powered by two 4,000-kg. 37V turbojets, from Bykovo on July 13, 1959.

AIR ROUNDUP.—The U.S. Army now has 2,400 helicopters, 3,000 fixed-wing aircraft and 73 guided-missile battalions.

CANADIAN AID.—Eighteen T-33 Silver Stars, the last of 97 aircraft donated by Canada to France under the Mutual Aid Programme are to be delivered this month. The R.C.A.F. has already handed over 60 Harvards and 19 Expeditors to the French Air Force.

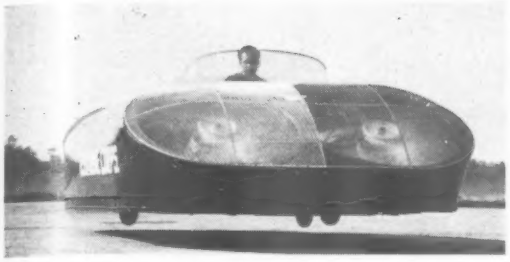
AERO GOLFERS.—The Aero Golfing Society held their Autumn meeting at Richmond Golf Club on October 2. The morning competition for the Cellon Challenge Cup was won by F. A. Laker 89—22 net 67; runner-up S. Roath 79—10 net 69. The afternoon 4-ball bogey competition was won by I. D. Roxburgh and S. W. C. Taylor, 9 up; runners-up S. Roath and L. G. Frise, 5 up.

HILLER MERGER.—Hiller Aircraft Corp. of Palo Alto, California, and the Twin Coach Corp. of Buffalo, New York, have announced that a merger of the companies is under discussion. Twin Coach manufactures aircraft and missile components. If the merger goes through, Stanley Hiller Jr., the Hiller president, would become president of the combined companies and William H. Coleman, Twin Coach president, would become chairman of the new board.

ASYMMETRIC APACHE.—A Piper Apache light-twin executive aircraft recently flew a distance of 1,304 miles around the State of Arkansas in 12 hr. 26 min. with the airscrew of the starboard engine removed. The Apache took off on one engine from Little Rock at 3,170 lb. gross in 3,500 ft., and cruised at 24 in. Hg. and 2,400 r.p.m. or 70% power.

TURBOJET SILENCING. — Rolls-Royce, Ltd., on behalf of Aerolineas Argentinas, has placed an order with Cullum Detuners, Ltd., of London, N.6, for an intake silencing system and a Cullum Detuner Mk. 15 to be installed in a new jet engine test bed. Rolls-Royce Avons will be tested initially but the plant is capable of testing future engines of greater thrusts.

NEW EXECUTIVE TWIN. — An American newcomer to the business flying market is the Beech Model 65 Queen Air, for delivery in 1960. With two 340 b.h.p. supercharged Lycoming GSO-480 engines, the Queen Air will carry six persons and their baggage over 1,000 miles in less than five hours with 45 min. fuel reserve. Gross weight of the Queen Air is 7,700 lb., and its useful load is nearly 3,000 lb. Maximum speed is 239 m.p.h. and single-engine ceiling 13,000 ft.



AIR-CUSHION TRAVEL.—This vehicle produced by the National Research Associates in the U.S. is known as the GEM-1. A two-seater, it has two 40-h.p. piston engines. Weighing 1,000 lb., it is intended to cruise at 38-58 m.p.h. at a height of 9-15 in.; the ground-cushion pressure is 10 lb./sq. ft.

SAHARA CONTRACT.—Four Fison-Airwork helicopters have been chartered by the French Compagnie Reynolds de Geophysique to assist in a geophysical survey being made in the French Sahara.

DOUGLAS ENGINEERING.—The engineering departments of Douglas Aircraft Co.'s Santa Monica and Long Beach divisions have been combined in a single Transport Aircraft Engineering organization. With headquarters at Santa Monica, this division assumes responsibility for military and commercial transport programmes under Mr. E. F. Burton, vice-president of Transport Aircraft Systems.

AUSTRALIAN INDUSTRY.—The Australian defence minister has told the Dominion's Parliament that it is government policy to maintain the aircraft industry, but not every element of it. He said that activity had expanded in the past two years with production of the Malkara anti-tank missile, the Jindivik jet target and other aircraft.

ANOTHER TURBOFAN.—General Electric has designed a private venture 4,000 lb. s.t. turbofan, the CF7000-1, for commercial use, based on the subsonic J85 turbojet with an aft fan similar to that developed for the CJ805-23. Deliveries would be possible by mid-1961, with F.A.A. certification by 1962.

JETSTAR TRIALS.—In 53 days of demonstration intensive flying trials, the Lockheed JetStar prototype covered 70,000 air miles in 145 flights. This prototype is now being fitted with four Pratt & Whitney JT-12 engines to test the production configuration.

CLOUD HEIGHT ANALYSER.—The U.S. National Bureau of Standards has developed a special-purpose computer for the Weather Bureau to analyse data received from a ceilometer, or cloud height indicator. On command, this small-scale data processor will tell an operator not only what the cloud height is at present, but what the highest, lowest, or predominant cloud height was at any time in the last 10 min., or how often clouds occurred below some critical level during this same period.

NEW OTTER.—de Havilland of Canada is developing a S.T.O.L. version of the Otter, with three-unit venetian-blind flaps, under a Defence Research Board contract.

BELL CONVERTIPLANE.—By the end of September the Bell XV-3 tilting-rotor convertiplane had made 64 conversions to and from hovering flight; the first was on December 18 last year. The XV-3 is now at NASA's Ames Research Center in California following U.S.A.F. tests at Edwards AFB.

PRODUCTION B-58A.—After making its first flight last month, the first production model of the Convair B-58A Hustler was to be delivered to Carswell Air Force Base (at Fort Worth) to equip the first operational squadron. Since the XB-58 first flew on November 11, 1956, a total of 30 test and development prototypes and preproduction aircraft have been built.

U.S. NAVY ZUNI.—In production for the U.S.N. is the solid-propellent Zuni, an unguided rocket for air-to-air or air-to-ground use.

Commercial Aviation Affairs

PLANS FOR THE VANGUARD . . .—B.E.A. has announced its intention of putting the Vickers Vanguard into service on July 1, 1960, on the London-Paris route.

. . . AND THE COMET.—During next summer, B.E.A. will be introducing its Comet 4Bs on trunk routes through the eastern Mediterranean and to Switzerland, Scandinavia, Nice, Warsaw and Moscow. According to Mr. Milward, in a recorded interview for Moscow Radio, the Comet will be introduced on that route next April.

MORE DC-8s.—Unannounced new orders and negotiations with present and new companies are expected to increase the total of DC-8s on order by 25 within the next few months.

TRAFFIC UP AGAIN.—M.T.C.A. provisional figures for August show that U.K. airline's traffic on scheduled and inclusive tour services increased by 14% over August, 1958, to 47.8 million short ton miles. Overall load factor rose from 63% to 65%. For the first eight months of 1958, traffic has been 14.7% higher than 1958 and 22.7% above the 1957 level.

T.A.A. TO BUY BRITISH?—According to Mr. Warren McDonald, chairman of the Australian National Airlines Commission, Trans-Australia Airlines is likely to spend £20 million on a fleet of British jet transports to replace its Viscounts and Electras between 1963 and 1966. The Minister for Civil Aviation, Senator Paltridge, said subsequently that no such re-equipment plan had been submitted to the Federal Government.

CAPITAL CHOICE.—Capital Airlines last week announced orders for seven Convair 880s and five Lockheed Electras, although financing arrangements have not been completed. General Dynamics Corp., Convair's parent company, is reported to be helping with financing, which has been a persistent problem for Capital. The airline still owes Vickers $37m. for Viscounts, and was unable to finance its proposed purchase of Comets.

IMPROVING THE JT3C.—American Airlines has announced a programme of modifications to the JT3C-6 engines in its fleet of Boeing 707s, to increase the max. power from 13,000 lb. to 13,500 lb. New stator vanes ahead of the first stage turbine will permit an increase of 10°C. in turbine inlet temperature. The $270,000 programme will start on November 1, with engines being modified as they pass through American's Jet Maintenance and Engineering Center for routine overhaul.

T.C.A. AND THE DC-8.—Deliveries of six Conway-engined DC-8s to T.C.A. will begin in December, and the airline will start operations with this type on April 1, 1960, on the Montreal-Toronto-Vancouver route. Daily service from Montreal to London will begin on June 1, with two services a week stopping at Prestwick. The T.C.A. DC-8s will seat 127 passengers.

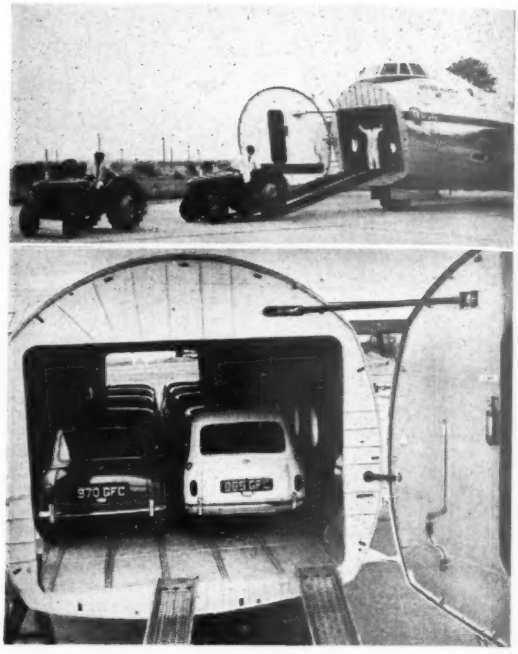
ELECTRA DELIVERIES.—By the end of September, 91 Electras had been delivered to nine airlines. They have flown 87,000 hours including 75,000 in revenue service.

DC-7F DELIVERED.—American Airlines has taken delivery of the first of 10 DC-7F airfreighter conversions from Douglas Aircraft. The airline, which put its DC-7s into service just five years ago, expects to have five airfreighters in service by the end of the year. The DC-7F carries a 33,500 lb. payload at 350 m.p.h. and will supplement American's DC-6A freight services.

INDEPENDENT COMMITTEE.—To represent the non-BIATA British airlines and charter companies in the forthcoming talks with the Minister of Aviation, a small committee is to be formed. Any interested parties are invited to contact Mr. Eric Hanks, chairman of Tradair, Ltd., or to attend a meeting at the Institute of Chartered Shipbrokers, Baltic Exchange Chambers, 25 Bury Street, E.C.3, at 11 o'clock on October 27.

K.L.M. AND THE DC-8.—Deliveries of 12 JT-4A-powered DC-8s to K.L.M. will begin in January, 1960, and daily service from Amsterdam to New York is to start in April. The DC-8 will be introduced on the Montreal-Houston-Mexico City route in May, on the Karachi-Bangkok-Tokyo route in midsummer, to Singapore and Sydney in October and on the route to the Caribbean in November.

FIGHT FOR BLACKBUSHE.—Staravia, one of the Blackbushe Airport tenants, is obtaining the views of operators and others in the hope that a good and valid case can be made for the retention of this airport for normal operations and for diversions. A decision, in principle, to close this airport by the end of 1960, was announced in August.



ARGOSY CARGOES.–Two different loads for which the AW 650 Argosy (four Rolls-Royce Darts) is eminently suitable. Top, two Massey-Ferguson tractors, carried to the Isle of Man with a load of tyres; and (bottom) eight Morris Mini-Minors accommodated in the hold with room to spare.

Military Aviation Affairs

JETSTAR SELECTED. — Lockheed JetStar has been selected by U.S.A.F. as a bombardier-navigator trainer, after evaluation of the JetStar and the McDonnell 119A. Funds have not yet been provided for production of the JetStar.

U.S.A.F. LOSSES.—Since 1950 the U.S.A.F. has lost over 3,470 pilots and 7,062 aircraft in accidents. Speaking in Chicago recently, the Deputy Inspector General for Safety of the Air Force stated that for every minute flown by the Service the cost of accidents totalled £300.

R.A.A.F. RADAR.—An American radar system known as Quadradar, because of its facilities in four different uses, is to be installed at a number of R.A.A.F. airfields in Australia. A low-cost precision approach aid, the equipment can also be used as a moderate capacity surveillance radar, as a height finder and as an airfield control radar.

NA.39 CRASH.—A Blackburn NA.39 crashed in the New Forest on October 12 during a test flight from Boscombe Down, killing its pilot and observer. It was flown by Mr. William Alford, a test pilot for the U.S. Office of Naval Research; the observer was Mr. John Joyce, of Blackburns.

R.A.F. DISBANDMENT.—No. 100 Squadron at R.A.F. Wittering and equipped with Canberras has recently been disbanded. The Squadron Standard, which was presented in 1955, has been laid-up in the church of St. George, Stamford.

R.A.F. MAINTENANCE.—The technical training of certain technicians has been reorganized by the R.A.F. so that such airmen will be responsible for a complete aircraft system. The first of these "systems tradesmen" have been trained on the propulsion system of the Britannia at Bristol Siddeley Engines and are now at R.A.F. Lyneham. At present the propulsion, power control and flight instrument systems of the Lightning are also to be maintained by such technicians.

GHANA AIR FORCE.—Last month the Prime Minister of Ghana opened an Air Force Training School in Accra. The school's first course has 15 air cadets, selected out of some 600 volunteers, and the chief instructors are Israelis.

CANADAIR 104s.—The Canadian Department of Defence Production has awarded a $91½ million contract to Canadair, Ltd., for the production of 200 Lockheed F-104G airframes for the R.C.A.F. The J79-GE jet engines for the Starfighters are to be made by the Orenda Engines Division of A. V. Roe Canada.

AIRCENT SHARP SHOOTERS.—In the recent 2nd AIRCENT annual air firing competition at Cazaux, France, the R.C.A.F. team came first with 1,697.8 pts., Fighter Command was 2nd with 1,427.2 pts. and R.A.F. Germany came 3rd with 1,075.2 pts.

News About People

U.S. AWARD.—Mr. K. E. Van Every, chief of the aerodynamics section, at Douglas' El Segundo division, has been awarded the Wright Brothers Medal by the U.S. Society of Automotive Engineers. His paper on "Design Problems of Very High Speed Flight," was judged the best in 1958 in the field covered by the award.

AIR TRAINERS LINK.—The chairman of Air Trainers Link, Ltd., Mr. J. M. Wallace, has relinquished his office and Air Chief Marshal Sir John Baker has been elected to the board and appointed chairman. Other new directors of the company are Lt.-Gen. Sir Frederick Wrisberg and Mr. J. W. Murray, chairman of the General Precision Equipment Corpn. of New York. The company will continue to design and manufacture flight simulators and industrial control computors, but recommendations have been made to broaden its interests and increase its capital resources. It is also proposed to change the company's name to General Precision Systems, Ltd.

B.E.A. APPOINTMENTS.—Mr. J. F. Norton, who has been B.E.A. sales manager in North America since 1957, is returning to England to become assistant sales manager. He is succeeded in New York by Mr. H. R. Roberts, who has been station manager, Sweden, for the past six years. Mr. R. Watts, the chief internal auditor, is to take over as manager, Sweden and Finland, and Mr. D. M. H. Russell is to succeed Mr. T. H. Pollock as manager, Malta and North Africa.

STARAVIA APPOINTMENT. — Mr. N. A. H. Luke has been appointed chief inspector of Staravia at Blackbushe. A past president of the S.L.A.E., he has been with Armstrong Siddeley (Brockworth), Ltd., since 1953.

SALES MANAGER. — Mr. Jeffrey Blake has been appointed sales manager of Elliott's Servo Components Division. He was formerly assistant sales manager of Land Pyrometers, Ltd., Sheffield.

News of Industry

Fulfilling Aeronautical Requirements

IN December, 1957, The Palmer Tyre Ltd.—which had been established in 1893 and was well known to the aircraft industry from its early days—changed its name to Palmer Aero Products Ltd. At the same time a new Aero Products Division of BTR Industries Ltd., came into being with Palmer as its marketing unit.

The company had for many years been a member of the BTR Group, and the change of title was the logical outcome of the demands of modern aircraft and missiles which had brought about its specialization in components for the aircraft industry. Putting BTR's aeronautical products under one division further helped to concentrate all the aviation resources of the Group; and the range of Palmer products, production facilities and research and development work has grown appreciably in the past 18 months.

Palmer Aero Products now has three production units. The main factory at Penfold Street off the Edgware Road in north-west London; a smaller factory at West Molesey, Surrey; and the new BTR plant at Farington, Lancs, which undertakes the production of all high-pressure hose, de-icing equipment and aircraft escape slides.

Manufacturing a wide range of aircraft and missile components, coupled with the operation of a number of specialist services such as industrial X-ray and Gamma-ray inspection facilities and prototype development work, the company's factory at Penfold Street specializes in aircraft "plumbing" for short and large production runs. For this, its manufacturing facilities are broken down into three main sections which are geared to provide a very quick turn-round.

There is a prototype department dealing with very short runs and two production shops for undertaking larger orders. Production is divided into three basic divisions—pipes, harnesses and general aircraft products. The general aircraft products division is the most diverse section and its work includes such items as filters, valves, wheels and brakes, and pneumatic rams and jacks. In addition, Palmer has an equipment servicing and maintenance department at Penfold Street, plus a mobile team of servicing engineers who are on 24-hr. call to the aircraft industry.

Among the products of the BTR Group marketed by the company are seals and "O" rings; rubber mouldings, extrusions and sections; inflatable equipment such as the aircraft escape slide, dinghies and seat packs, aerofoil de-icing equipment, and all types of rubber—natural, synthetic and silicone.

The Palmer non-destructive test house is approved by the Ministry of Supply and by the Air Registration Board. It now includes ultrasonic test equipment as well as the usual X-ray and Gamma-ray test facilities. Capable of checking metals, plastics, fabrications and assemblies, the service has both factory-sited laboratories and mobile vans. Equipment for pressure and low-temperature testing are in the company's pipe

Photograph copyright "The Aeroplane and Astronautics"

A test rig for high-pressure flexible pipes; the operator is fitting a Silvoflex pipe on the rig. Fluoroflex p.t.f.e. pipes are already on rig (foreground).

End crimping of Palmer Fluoroflex p.t.f.e. high-pressure pipe.

Harness assembly line at Penfold Street factory.

Photograph copyright "The Aeroplane and Astronautics"

Palmer—Parmatic filters being assembled at Penfold Street.

and filter test laboratories which undertake prototype and spot production test work.

Flexible and rigid pipes are the largest single product at Penfold Street, and are manufactured for test-rig and ground equipment applications as well as for aircraft and guided missiles. These include p.t.f.e. (Fluoroflex), rubber (Silvoflex), metallic flexibles (Palmaflex), corrugated pipes (Corroflex) and a wide range of high- and low-pressure hose assemblies.

Marketed under the trade name of Silvoflex, the company's range of high-pressure flexible rubber hose has been in general use for many years and its applications include Rolls-Royce Dart turboprop engines on which it has accomplished no less than 6,000,000 flying hours without failure. Available in single-wire and double-wire form with standard or fire-proof construction, its tube or lining is manufactured from natural or synthetic rubber compounded to withstand the effects of high temperatures, oils, fuels and other fluids. The tube is braided with high-tensile steel wire and this is in turn protected by a rubber covering compound designed to provide resistance against ageing and chemical action.

Before assembly of the hose with the company's Type 200 end-fittings its ends are prepared so that the inner rubber tube is separated locally from the wire braiding to allow its insertion into an annular cavity in the end fitting. The lipseal is so formed that pressure tightness within the coupling does not rely on the mechanical swaging action of the outer ferrule.

An "interlock" to secure the end-fitting to the hose is provided by gripping the wire braid between the insert and the ferrule. The entire assembly is finally swaged together under hydraulic pressure.

Another range of rubber hose assembly produced by Palmer is for low pressures. These units are suitable for use with all normal aircraft gases, anti-freezing and engine oils, petrol and hydraulic fluid and are designed for function between the temperature limits of −40° C. and +90° C.; working pressure is 300 p.s.i.

A development from the earlier rubber hoses is Fluoroflex flexible pipes which have a tube manufactured from p.t.f.e. The advantages of these pipes over the rubber hoses are extended temperature operating limits, a saving of up to 30% in weight and no limiting "shelf life" in storage.

Inert to all aircraft fuels and oils, these p.t.f.e. pipes are satisfactory for continuous service at internal and ambient temperatures between −73° C. and +232° C., and up to 260° C. in many conditions. Pipe construction consists of an extruded p.t.f.e. tube which is reinforced with one or more layers of high-tensile steel wire braid. The outer layer of braid is stainless steel, and in two-wire constructions the first braid is of carbon steel separated from the outer braid by an interlayer of Fluon tape. Palmer Fluoroflex pipes are being fitted to D.H. Comet 4Bs for B.E.A. and also supplied to Vickers-Armstrongs for the Vanguard.

In addition to rubber and p.t.f.e. flexible hose assemblies, Palmer manufacture flexible pipes constructed from helically convoluted seamless stainless steel tubing which has been ultrasonically examined for incipient cracks or flaws. The helically convoluted tubing is close-braided with stainless steel wire and the end fittings, of the brazed swaged type, are also manufactured from stainless steel bar stock. The complete assemblies are marketed under the trade name of Palmaflex.

To accommodate the effects of thermal expansion and for installations where high-frequency vibrations are experienced, the company has developed corrugated rigid stainless steel pipes.

The company also manufactures electrical harness with conventional rigid low-tension electrical conduits and a newer design using flexible conduit. The main advantage of the new type of electrical harness over the rigid assemblies, apart from its flexibility, is its lower weight.

One of the latest successful additions to the company's wide range of aircraft products is Palmer-Parmatic filters. These are now being supplied for production versions of the English Electric Lightning. Pioneered by Parmatic Engineering, Ltd. of Canada, the filters are suitable for air, hydraulic and fuel system requirements.

Gliding Notes

by Dr. A. E. Slater

NEXT year's World Gliding Championships are to be held at an aerodrome near Cologne from June 4 to 19, 1960, and the preliminary practice period will be from May 29 to June 3.

This will give a minimum run of 125 miles due east to the East German frontier, and a maximum of 350 miles south-eastwards to the farthest point in Germany on the Austrian frontier; Switzerland is 230 miles away, and Denmark 275 miles. It remains to be seen whether the rules allow any of the western frontiers to be crossed. But, no doubt, many of the tasks will be out-and-returns or races round triangles.

The first international gliding contest was held in 1937, also in Germany, at the historic site on the Wasserkuppe mountain, where the World's first soaring flights of over an hour had been made only 15 years earlier. A triangular course was set even at that contest; it was only 35 km., and pilots could try for it any time they wanted, but nobody succeeded in getting round. All cross-countries were made directly down wind, and the longest distance was 218 miles to Hamburg, achieved by Hanna Reitsch and Heini Dittmar of Germany and Mr. Mynarski of Poland. Dittmar won the whole contest, and British pilots finished 12th, 14th, 16th and 21st, among 26 entries.

* * *

BRISTOL GLIDING CLUB has gloried its news bulletin with a name: *Severn Skies*, and the first issue under this title summarizes the flying up to July, which was the best month in the club history with 250 hours and over 2,000 miles across country.

A Spanish gliding holiday is described by one member, Roger Barnett, who was one of a limited number of foreigners allowed on a Silver "C" course at the Monflorite gliding school in the foothills of the Pyrenees, a 7s. taxi ride from Huesca. The site has a ridge facing west, about 250 ft. high and several miles long, but no strong winds blew up it while Barnett was there. However, the thermals were good.

Since the best thermals go up at *siesta* time, I have often wondered what Spanish glider pilots do about it. At Monflorite they have it in the late morning instead—or at least they do no flying from 10.30, when morning circuits cease, till 12.30, when thermals are about to begin. These thermals go up to 6,000 ft. on a good day, with lift at 12 ft./sec., and usually there were two Kranichs, half a dozen Grunaus and a Sky or a Weihe all using them. Launches were by a Fieseler Storch, which dropped its cable indiscriminately, so that people dived under a wing for shelter; curiously enough, it never damaged the wing it fell on.

One rather interesting finding by the Bristol Club is that a large proportion of its cable-breaks are suffered by the same six or seven pilots. Think that one out.

* * *

SIEGFRID NEUMANN became the first member of Cambridge University Gliding Club to add a Diamond to his Gold "C" when he flew 200 miles solo in the club Eagle to Winkleigh in Devon in mid-September; he took 5½ hours. Neumann is at present leading in the annual Oxford-Cambridge contest for the fastest flight between the two clubs, with a flight of 126 miles from Cambridge to the Oxford Club's site at Weston-on-the-Green, and back to Cambridge, where there was another two hours' thermal activity yet to go. Before this, the best performance had been a one-way journey by Anita Schmitt.

On September 27 the Skylark 3 presented to the Handley Page Gliding Club by Sir Frederick Handley Page left Radlett at 3 p.m., flown by Paul Langston, and later turned up 55 miles away at Lasham.

On the same day, Geoffrey Stephenson made an out-and-return from Dunstable to Cambridge and back, having done Oxford-and-return a week earlier when the aerobatic contest was on.

Of the toy balloons released during the aerobatic contest, three have been returned from across the Channel. Ken Machin's son, Gordon, had his returned from Brake in North Germany, on the lower Weser, 400 miles to the E.N.E., where it was found the next day; it had been launched at 16.00 hrs. B.S.T., when thermals were still active, and should have taken 24 hours over the journey at the speed of the gradient wind. It would therefore have crossed the sea (comparatively warm by night) between 21.30 and 06.00 hrs. and may have caught more thermals in Holland, as low-level drift is necessarily towards the bases of thermals.

Another balloon reached Friesland, east of the Zuider Zee, probably too early to catch thermals: and a third reached Thiepval in France.

* * *

PERMISSION to soar over Mount Everest has been refused to Dr. D. Brennig James by the Nepalese government, on the ground that it would be embarrassing if he landed in Tibet. Unlike the members of an earlier expedition with power-driven machines, he would at least know where to expect downcurrents.

* * *

CAMPHILL, the Derbyshire and Lancashire Club has a bonfire party on November 7, and the Christmas party is on December 19.

Correspondence

Satellite Scale Drawings

MAY I ask if the similarity of outline between the casing of Sputnik 2 and the fore part of its big brother is regarded as coincidental? If "2" is superimposed on "3" and then placed inside, as it were, Lunik, it seems just possible that we have an impression of the basic launching vehicle at its various stages of advance. The fact that the rather inflexible "3" aerials just occupy the available space inside a Lunik-sized nose-cone seems to confirm this. Perhaps you can comment?

Secondly, can you say whether the pin at the centre of Lunik's base is a socket plug, and if the attachments round the edges are some form of clamp? If so, would they be strong enough to carry the weight for a horizontal type launch?

Thirdly, harking back to "Kentigern's" (THE AEROPLANE, December 13, 1957) estimate that an airborne launch only saves 1/200th of the work, did he take into account the Mach number of the launch which must be about 1/40th of escape velocity to make it worth while? He appeared to consider only the altitude.

Cirencester, Glos. G. B. BATHURST.

[A reply from our astronautical correspondent will appear next week.—ED.]

How Come?

I DO like the new weather cock you have given them at Croydon—how on earth did you get it up there?

Sutton, Surrey. "AN ADMIRER."

[It took a tremendous effort, but M.T.C.A. managed it entirely on their own. The original of the picture alongside appeared in our issue for October 9. —ED.]

Facts Wanted

I WOULD like some "gen" on the ill-fated Lockheed Altair "Lady Southern Cross" flown by Kingsford-Smith. It left Lympne in November, 1935, and flew into the blue.

Could you answer the following:—

1. What date did it arrive in England by ship. Was it flown solo by Smithy off the Thames mudbank?
2. Do you know the name of the ship and its embarkation port?
3. Did Smithy fly it across the States if the embarkation port was on the United States east coast?
4. Was it still registered Australian VH-USB when it arrived?
5. What date was it given a British registration and what was the lettering as available pictures here are too hazy or, in ground shots, people are obscuring same. It looks like G-A?U?. The last letter is possibly S.

As I have all data prior to the above period I would appreciate any assistance.

Mentone, Victoria, Australia. MONTY TYRRELL.

G.-W. and the Tabloid

GEORGE F. JOSEPH of Auckland, New Zealand, must be referring to the Grahame-White "Baby" not Tabloid. This was a miniature version of the Henri Farman with 50 h.p. Gnome.

The Baby was entered for the Circuit of Britain from the G.-W. stable to be flown by C. Compton Patterson, one of his demonstration pilots, a very small man who fitted into the Baby fairly well. It was intended as a racer and was not easy to land. Patterson flew it on the first leg from Brooklands to Hendon in very bumpy conditions and when he got to Hendon he told G.-W. it was too dangerous and "he'd had it" so far as the race was concerned and retired.

G.-W. was simply furious and to prove the Baby was safe he took it up himself and threw it about in a wonderful display of low (almost) crazy flying. But after that the Baby was little in evidence so there may have been something in what Patterson said.—G.-W. was a superb pilot and could fly aircraft that less skilled pilots fought shy of.

"Tabloid" was a trade name registered by Burroughs Wellcome and they strongly objected to Sopwith calling his little biplane by that name. Nevertheless, the name stuck and several small aircraft were nicknamed Tabloid including a Bristol, Vickers, and a G.-W. tractor biplane better known as "Lizzie," I don't know why. The pilot who flew it most was Reggie (R. H.) Carr who now works at Handley Page and no doubt he knows how "Lizzie" got that name; and what the Baby was really like.

London, S.W.5. GEOFFREY DORMAN.

Aroundabout

Feather-brained Scheme. Truth can be more wildly funny than anything I strain to think up. A Washington report says that the U.S. Navy and Harvard University spent three years trying to train pigeons to steer missiles. The bird inside the missile was to keep its eye on a screen on which a spot would appear when the missile started veering off target. By pecking at the spot, the bird would put controls to work to bring the missile back on course. Under ideal conditions pigeons could be trained well enough to do the job but since war conditions are seldom ideal, the Navy dropped the idea in 1951 without having flown a pigeon in a missile. It was, they said, strictly for the birds.

*

Born Creeper. An officer who eats mice and sleeps in a box is serving with 88 Sqn. at Wildenrath. Flying Officer Fred Aldrovandi has 15 flying hours in Canberra B.8s and disdains flying kit. The Squadron badge, a snake poised to strike, provides the clue to all this, for Fred, the Squadron mascot belongs to the Aldrovandi species of Italian snakes.

*

Nothing Sacred. Birds in missiles, snake in a Canberra and now unlucky spiders in Vanguards. Or is that just my ignorant interpretation of the Vickers Vanguard drive shaft modification which calls for the introduction of "vapour blasted spiders"?

*

PRO and CON—2*. More deadly dictionary definitions of P.R.O.-manship:—

PRObang: An instrument for pushing obstructions down the œsophagus (i.e., for ramming stuff down the throat).

PROdigal: Given to lavish expenditure—("No, this is on me, Bill—my firm can afford it much better than your firm").

PROlepsis: A figure of speech, or an expression, which anticipates an effect—("Prolepsis No. 95—not to be released before morning papers of . . .").

PRObability: The *appearance* of truth.

[*Dates of previous items in this series are: P and C 1, September 25, P and C 3, October 2 and P and C 4, October 9.—ED.]

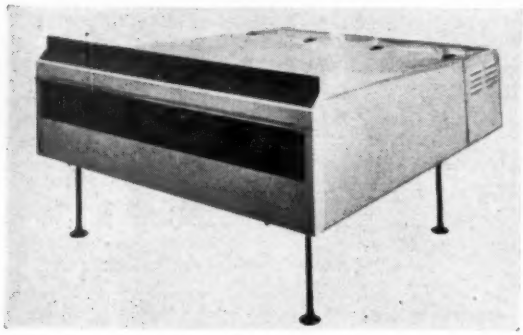
*

Fairey at the Bottom of our Warton. In reporting the loss of the Lightning, the *Birmingham Mail* reminded us that it was in a Lightning in 1956 that Peter Twiss set up a World speed record.

*

by Lorenz

NOTES AND EVENTS



VISUAL LANDING.—New at Farnborough this year was the Visual Glide Path Indicator developed jointly by R.A.E. and Thorn Electrical Industries Ltd. The company has also reached an agreement with N.R.D.C. for commercial manufacture of the equipment. Described in our issue of August 15, 1958, the indicator uses light projectors at the limits of the desired touch-down area which define the correct glide path.

INDUCTION HEATING.—The R.F. Heating Division of Pye, Ltd., is organizing a course for users and potential users of induction heating. Details of the course, which starts on December 1 and lasts for three days, can be obtained from Mrs. E. Raeburn, Pye Process Heating, 28 James Street, Cambridge.

DECCA CENTURY.—One hundred Decca 424 airfield control radars have now been ordered, with the placing of a contract for this equipment by Marshalls of Cambridge. The airfield at Cambridge is a busy one, with flying training, specialized test flying and scheduled air transport movements.

ROAD TESTS. — The 1959 edition of *The Motor* Road Tests has been published by Temple Press Limited. The published price is 10s. 6d. net from all booksellers and bookstalls, or by post 11s. 4d. from Temple Press Limited, Bowling Green Lane, London, E.C.1.

NEW OFFICE.—Frederick S. Snow and Partners moved into a new office building—Ross House, 144 Southwark St., London, S.E.1—on October 12. Airport development is among the interests of this partnership of consulting engineers.

ELECTRONIC HEAT.—A new cooling fluid for use in computers, control systems, and other types of electronic equipment has been developed by Monsanto Chemicals, Ltd. The fluid, Montosil E, has been specifically developed for use in electronic systems capable of withstanding very high temperatures, such as those installed in high-speed aircraft and rockets. It has adequate viscosity throughout the temperature range between −650° F. and +400° F., and its pour point is below −100° F.

A CAREER IN ENGINEERING.—A new illustrated brochure, describing the opportunities available to youths entering the profession of production engineering, and entitled "A Career in Production Engineering" has just been published by the Institution of Production Engineers. Copies may be obtained from the Institution at 10 Chesterfield Street, Mayfair, London, W.1.

FILTER BOOKLET. — Auto-Klean Strainers, Ltd., have published a brochure entitled "Auto-Klean in Industry." It describes the company's range of filters and illustrates some of their more unusual applications in engineering. Copies are available on request from the company's Lascar Works, Hounslow, Middlesex.

EMERAUDE SUPPLIER.—Personal Plane Services of Ashford, Middlesex, has been appointed agent for the products of Ets. Claude Rousseau of Dinard. The company can supply parts and components for the Emeraude lightplane and also complete aircraft of the latest type at short notice.

Aviation Calendar

October 27.—Radar and Electronics Association lecture, "Electronics in Supersonic Flight," by F. W. Page, B.A., F.R.Ae.S., at the Royal Society of Arts, John Adam Street, Adelphi, **London,** W.C.2, at 19.30 hrs.

October 27.—Society of Instrument Technology lecture, "Modern Developments in Optical Instruments," by J. H. Bach, B.Sc., and G. E. Fisher, at Manson House, 26 Portland Place, **London,** W.1, at 19.00 hrs.

October 27.—R.Ae.S. Luton Branch debate, motion, "That this house considers that the craze for speed is technically unsound, economically undesirable and has taken all the romance and most of the interest out of travel," at the Napier Senior Staff Canteen, **Luton Airport,** at 18.15 hrs.

October 28.—R.Ae.S. Graduates' and Students' Section lecture, "The Setting of Aircraft Specifications," by R. H. Whitby, at the Library, 4 Hamilton Place, **London,** W.1, at 19.30 hrs.

October 28.—R.Ae.S. Preston Branch lecture, "Glass and Its Uses," by Dr. A. J. Holland, at the R.A.F.A. Hall, **Preston,** at 19.30 hrs.

October 28.—R.Ae.S. Christchurch Branch lecture, "The Development of the Viscount Fuel System," by G. B. Hustings, at the Kings Arm Hotel, **Christchurch,** at 19.30 hrs.

October 29.—R.Ae.S. Special General Meeting, at 4 Hamilton Place, **London,** W.1, at 18.30 hrs.

October 29.—R.Ae.S. Belfast Branch lecture, "The Importance of Reliability in Modern Technology," by Air Vice-Marshal A. V. Hutton, C.B., C.B.E., D.F.C., B.A.(Cantab.), D.I.C., M.I.M.E., F.R.Ae.S., at the Lecture Hall LG8, David Kein Building, Queen's University, **Belfast,** at 19.00 hrs.

October 30.—R.Ae.S. inaugural lecture, "Man-Powered Aircraft Group—Résumé of the Theory and Practice," by H. B. Irving, Dr. D. R. Wilkie, T. R. F. Nonweiler, B. S. Shenstone, at the R.Ae.S. Library, 4 Hamilton Place, **London,** W.1, at 19.00 hrs.

October 31.—R.Ae.S. Luton Branch, visit to de Havilland Engine Co. test beds at **Hatfield.**

November 2.—R.Ae.S. Boscombe Down Branch lecture, "Inertia Navigation," by J. E. Pateman, Asst. General Manager, Elliot Bros. (London), Ltd., at the Lecture Hall, A. and A.E.E., **Amesbury,** Wilts, at 17.30 hrs.

November 2.—R.Ae.S. Derby, Fourth Sir Henry Royce Memorial Lecture, "Power for an Airline," by B. S. Shenstone and H. G. Rossiter, at Rolls-Royce Welfare Hall, Nightingale Road, **Derby,** at 18.15 hrs.

November 2.—R.Ae.S. Henlow Branch lecture, "Black Knight," by H. G. R. Robinson, in building 62, The Technical College, **Henlow,** at 19.45 hrs.

Company Notices

New Patents

APPLICATIONS ACCEPTED

823,957.—Fairey Aviation Co., Ltd.—"Jettisonable articles for aircraft and aircraft carrying such articles."—July 19, 1957. (April 19, 1956.)

823,658.—Soc. Nationale D'Etude et de Construction de Moteurs D'Aviation.—"Directional discharge-nozzle device."—Nov. 28, 1957. (Dec. 6, 1956.)

Printed specifications of the above will be available on November 18, 1959, and the opposition period will expire on February 18, 1960.

824,620.—Pacific Scientific Aeroproducts.—Control Line Regulator. Jan. 25, 1957 (Jan. 30, 1956). (Divided out of 821,468).

824,560.—Saunders-Roe, Ltd.—Aircraft. Nov. 16, 1956 (Aug. 16, 1955).

Applications open to public inspection on Dec. 2, 1959, opposition period expires on March 2, 1960.

NEW COMPANIES

A.N.T. Travel Services, Ltd. (637,679).—Private co. Reg. Sept. 23. Cap. £100 in £1 shs. Directors: Emanuel Goodall, 204 Inver Road, Bispham, Blackpool; Thomas McKeller, 419 Devonshire Road, Blackpool; Frank Tingle; W. S. Bateson. Sec.: F. Tingle. Reg. Office: Blackpool Airport, Blackpool.

Mediterranean Villas, Ltd. (637,464).—Private co. Reg. Sept. 18. Cap. £100 in £1 shs. Objects: To carry on the business of touring agency, travel bureau and booking office, etc. Directors: Desmond R. Bramwell, 7 Weymouth Court, 1 Weymouth Street, W.1; Kazimierz S. H. Swiderski, 18 Denmark Avenue, S.W.19. Sec.: Kazimierz S. H. Swiderski. Reg. Office: 7 Weymouth Street, W.1.

Personal Notices

BIRTHS

Blount.—On October 11 at Singapore, to Susan, wife of Sqn. Ldr. C. Blount, M.V.O., No. 45 Squadron, R.A.F. Tenagh, Singapore—a son.

Brown.—On October 4, at Bedale, Yorkshire, to Janet (*née* Warner), wife of Flt. Lt. G. Brown—a daughter.

Davis.—On September 26, at Rinteln, Germany, to Shelagh (née Cussen), wife of Flg. Off. M. Davis, R.A.F.—a daughter.

Farley.—On October 2, at Chatham, New Brunswick, Canada, to Tina, wife of Sqn. Ldr. G. G. Farley, R.A.F.—a daughter.

Field.—On October 4, at Cirencester, to Joan (*née* Rial), wife of Flt. Lt. H. Field, R.A.F.—a daughter.

Kielly.—On October 5, at Craigtoun Maternity Hospital, St. Andrews, to Dorothy (*née* Payne), wife of Flt. Lt. J. P. Kielly—a daughter.

Lancaster.—On October 5, at Mtarfa, Malta, to Zena (*née* Quilliam), wife of Flt. Lt. D. W. Lancaster, R.A.F.—a son.

Murphy.—On October 11, at P.M.R.A.F. Hospital, Halton, to Wendy, wife of Flt. Lt. D. Murphy—a son.

Nixon.—On September 24, to Patricia (*née* Kingsley), wife of Flt. Lt. M. Nixon—a daughter.

Taylor.—On October 2, at R.A.F. Hospital, Wegberg, Germany, to Margot (*née* Price), wife of Flg. Off. S. Taylor, R.A.F.—a daughter.

MARRIAGE

Neale-Stratton.—On October 3, at All Saints Church, Faringdon, Lt. John Neale to Ruth Beatrice, younger daughter of Wg. Cdr. and Mrs. H. A. C. Stratton of the Bell Hotel, Faringdon, Berks.

DEATHS

Wilson.—On October 3, at the Beverley Westwood Hospital, Major John Philip Wilson, D.F.C., R.F.C. (Retd.).